ACADEMIC REGULATIONS
PROGRAMME STRUCTURE
AND
DETAILED SYLLABUS

GR22

Bachelor of Technology
Computer Science and Engineering
(Data Science)
(Effective for the students admitted from the Academic Year 2022-23)

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

(Autonomous)

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ACADEMIC REGULATIONS PROGRAMME STRUCTURE & DETAILED SYLLABUS

Bachelor of Technology Computer Science and Engineering (Data Science)

(Four Year Regular Programme)
(Applicable for Batches Admitted from 2022-23)

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

Bachupally, Kukatpally, Hyderabad, Telangana, India- 500090

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
HYDERABAD
Academic Regulations for B.Tech (Regular) under GR22
(Applicable for Batches Admitted from 2022-23)

Under Graduate Degree Programme in Engineering and Technology (UG)

Gokaraju Rangaraju Institute of Engineering and Technology (GRIET) offers a 4-year
(8 Semesters) Bachelor of Technology (B.Tech) degree programme. The following programmes
are offered in GRIET.

S.No	Department	Programme Code	Programme
1	Civil Engineering	01	B.Tech Civil Engineering
2	Electrical and Electronics Engineering	02	B.Tech Electrical and Electronics Engineering
3	Mechanical Engineering	03	B.Tech Mechanical Engineering
4	Electronics and Communication Engineering	04	B.Tech Electronics and Communication Engineering
5	Computer Science and Engineering	05	B.Tech Computer Science and Engineering
6	Information Technology	12	B.Tech Information Technology
7	Computer Science and Business System	32	B.Tech Computer Science & Business System
8	Computer Science and Engineering (AIML)	66	B.Tech Computer Science and Engineering (AIML)
9	Computer Science and Engineering (Data Science)	67	B.Tech Computer Science and Engineering (Data Science)
10	Computer Science and Engineering (Artificial Intelligence)	61	B.Tech Computer Science and Engineering (Artificial Intelligence
11	Computer Science and Information Technology	33	B.Tech Computer Science and Information Technology

GR22 Regulations shall govern the above programmes offered by the Departments with effect from the students admitted to the programmes in 2022-23 academic year is given below.

1. **Medium of Instruction:** The medium of instruction (including examinations and reports) is English.
2. **Admissions:** Admission to the undergraduate (UG) Programme shall be made subject to the eligibility, qualifications and specialization prescribed by the Telangana State Government/JNTUH University from time to time. Admissions shall be made either on the basis of the merit rank obtained by the student in the common entrance examination conducted by the Government/University or on the basis of any other order of merit approved by the Government/University, subject to reservations as prescribed by the Government/University from time to time.
3. **Programme Pattern:**
   a) Each Academic Year of study is divided into two semesters.
   b) Minimum number of instruction days in each semester is 90.
   c) Grade points, based on percentage of marks awarded for each course will form the basis for calculation of SGPA (Semester Grade Point Average) and CGPA (Cumulative Grade Point Average).
   d) The total credits for the Programme are 160.
   e) A student has a choice to register for all courses in a semester / one less or one additional course from other semesters provided the student satisfies prerequisites.
   f) All the registered credits except Mandatory and Value Added Courses will be considered for the calculation of final CGPA.
   g) Each semester has 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)'. Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as indicated by UGC, and course structure as suggested by AICTE are followed. The terms 'subject' and 'course' imply the same meaning.
   h) **Course Classification:** All courses offered for all undergraduate programmes in B.Tech degree programmes are broadly classified as follows

S. No.	Broad Course Classification	Course Group/ Category	Course Description
1	BS	Basic Science	Includes Basic Science Courses
2	ES	Engineering Science	Includes Engineering Courses
3	HS	Humanities and Social Sciences	Includes Management Courses
4	PC	Professional Core	Includes Core Courses related to the parent discipline/department/ branch of Engineering
5	PE	Professional Elective	Includes Elective Courses related to the parent discipline/ department/ branch of Engineering

6	OE	Open Elective	Elective Courses from other technical and/or emerging subjects
7	PW	Project Work	Project work, seminar and internship in industry or elsewhere
8	MC	Mandatory Courses	Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Traditional Knowledge, Co and Extra Curricular Activities
9	VAC	Value Added Courses	Courses on current industry relevant topics improving breadth and depth in domain

4. **Award of B.Tech Degree:** The Undergraduate Degree of B.Tech shall be conferred by Jawaharlal Nehru Technological University Hyderabad (JNTUH), Hyderabad, on the students who are admitted to the programme and fulfill all the following academic requirements for the award of the degree

a) A student pursues the course of study and completes it successfully in not less than four academic years and not more than eight academic years.
b) A student has to register for all the 160 credits and secure all credits (with CGPA $\geq$ 5).
c) A student must fulfill all the academic requirements for the award of the degree.

5. **Attendance Requirements:**

a) A student shall be eligible to appear for the semester-end examinations if he/she puts in a minimum of 75% of attendance in aggregate in all the courses concerned in the semester.
b) Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in a semester may be granted. A committee headed by Dean (Academic Affairs) shall be the deciding authority for granting the condonation.
c) Students who have been granted condonation shall pay a fee as decided by the Finance Committee.
d) Shortage of Attendance more than 10% (attendance less than 65% in aggregate) shall in no case be condoned.
e) Students whose shortage of attendance is not condoned in any semester are detained and are not eligible to take their end examinations of that semester. **They get detained and their registration for that semester shall stand cancelled**, including all academic credentials (internal marks etc.,) of that semester. **They will not be promoted to the next semester**. They may seek re-registration for all those subjects registered in that semester in which the student is detained, by seeking re-admission into that semester as and when offered; if there are any professional electives and/ or open electives, the same may also be reregistered if offered. However, if those electives are not offered in later semesters, then alternate electives may be chosen from the **same** set of elective subjects offered under that category.

A student fulfilling the attendance requirement in the present semester shall not be eligible for readmission into the same class.

6. Paper Setting, Evaluation of Answer Scripts, Marks and Assessment:

a. Paper setting and evaluation of the answer scripts shall be done as per the procedures laid down by the Academic Council from time to time.

b. Distribution and Weightage of marks

S. No	Components	Internal	External	Total
1	Theory	40	60	100
2	Practical	40	60	100
3	Graphics for Engineers	40	60	100
4	Mini Project	40	60	100
5	Project Work	40	60	100

c. Continuous Internal Evaluation and Semester End Examinations: The assessment of the student's performance in each course will be based on Continuous Internal Evaluation (CIE) and Semester-End Examination (SEE). The marks for each of the component of assessment are fixed as shown in the following Table.

Assessment Procedure:

S. No	Component of Assessment	Marks Allotted	Type of Assessment	Scheme of Examinations
1	Theory	40	Internal Examination & Continuous Evaluation	1) Two mid semester examination shall be conducted for 30 marks each for a duration of 120 minutes. Average of the two mid exams shall be considered **i) Subjective – 20 marks** **ii) Objective – 10 marks** 2) Continuous Evaluation is for each unit using **i) Assignment – 05 marks** **ii) Quiz/Subject Viva-voce/PPT/Poster Presentation/ Case Study on a topic in the concerned subject – 05 marks**
		60	Semester end examination	The semester-end examination is for a duration of 3 hours
2	Practical	40	Internal Examination & Continuous Evaluation	One internal lab examination towards the end of course for a duration of 90 minutes with a viva of 5 minutes. **i) Internal Exam-10 marks** **ii) Viva voce – 10 marks** **iii) Continuous Assessment- 10 marks** **iv) G-Lab on Board(G-LOB) (Case study inter threading of all experiments of lab)/ Laboratory Project/Prototype Presentation/App Development -10 marks**

		60	Semester end examination	The semester-end examination isfor a duration of 3 hours. i) write-up (algorithm/flowchart/procedure) as per the task/experiment/program - **10 marks** ii) task/experiment/program-**15 marks** iii) evaluation of results -**15 marks** iv) write-up (algorithm/flowchart/procedure) for another task/experiment/program- **10 marks** v) viva-voce on concerned laboratory course - **10 marks**
3	Graphics for Engineers	40	Internal Examination & Continuous Evaluation	1) Two mid semester examination shall be conducted for 15 marks each for a duration of 90 minutes. Average of the two mid exams shall be considered 2) Day-to-Day activity -15 marks 3) Continuous Evaluation using • **Assignment – 05 marks** • **Quiz/Subject Viva-voce/PPT/Poster Presentation/ Case Study on a topic in the concerned subject – 05 marks**
		60	Semester end examination	The semester-end examination is for a duration of 3 hours

d) Mini Project:

S. No	Component of Assessment	Marks Allotted	Type of Assessment	Scheme of Examinations
1	Mini Project	40	Continuous Evaluation & Internal Evaluation	1) The supervisor continuously assesses the students for 20 marks i) **Continuous Assessment – 15 marks** • Abstract Presentation - 3 marks • Architectural Design Presentation - 3 marks • Modules Presentation - 3 marks • Execution Cycle 1 Presentation - 3 marks • Execution Cycle 2 Presentation - 3 marks ii) **Report – 5 marks** 2) At the end of the semester, Mini Project shall be displayed in the road show at the department level. Mini Project is evaluated by Mini Project Review Committee for **10 marks**.

				3) Technical Event Participation in project area/MOOCs Course in project area/ Paper Publication/Publishing or Granting of a Patent/Hackathon participation/ Book Publication – **10 marks**
		60	External Evaluation	The mini project report shall be presented before Project Review Committee in the presence of External Examiner and the same is evaluated for **60 marks**.

Note:
  i) Mini Project Review Committee consists of HoD, Mini Project Coordinator and Supervisor.
  ii) Plagiarism check is compulsory for mini project report as per the plagiarism policy of GRIET.

e) **Internship/Skill Development Course/ Industrial Training:** Internship/Skill Development Course/Industrial Training shall be done by the student immediately after II-Year II Semester Examinations and pursue it during summer vacation/semester break & during III Year without effecting regular course work. Internship/Skill Development Course/Industrial Training at reputed organization shall be submitted in a report form and presented before the committee in III-year II semester before end semester examination.

f) **Project Work (Phase–I and Phase-II):**

S. No	Component of Assessment	Marks Allotted	Type of Assessment	Scheme of Examinations
1	Project Work (Phase- I and Phase -II)	40	Continuous Evaluation & Internal Evaluation	1) The supervisor continuously assesses the students for 20 marks **Continuous Assessment – 15 marks** • Abstract Presentation - 3 marks • Architectural Design Presentation - 3 marks • Modules Presentation - 3 marks • Execution Cycle 1 Presentation - 3 marks • Execution Cycle 2 Presentation – 3 marks **Report – 5 marks** 2) At the end of the semester, Project work shall be displayed in the road show at the department level. Project work is evaluated by Project Review Committee for **10 marks.** 3) Technical Event Participation in project area/ MOOCs Course in project area/ Paper Publication/Publishing or Granting of a Patent/Hackathon participation/Book Publication – **10 marks.**
		60	External Evaluation	The Project report shall be presented before Project Review Committee in the presence of External Examiner and the same is evaluated for **60 marks**.

Note:

    i) Project Review Committee consists of HoD, Project Coordinator and Supervisor.

    ii) Plagiarism check is compulsory for project work report (Phase I and Phase II) as per the plagiarism policy of GRIET.

    iii) The above rules are applicable for both Phase I and Phase II.

g) The evaluation of courses having ONLY internal marks in I-Year I Semester and II Semester is as follows:

• I Year courses: The internal evaluation is for 50 marks and it shall take place during I Mid-Term examination and II Mid-Term examination. The average marks of two Mid-Term examinations is the final for 50 marks. Student shall have to earn 40%, i.e 20 marks out of 50 marks from average of the two examinations. There shall be NO external evaluation. The student is deemed to have failed, if

he/she (i) is absent as per schedule, or (ii) secures less than 40% marks in this course.

• II Year II Semester *Real-Time/Field-based Research Project/Societal Related Project* course: The internal evaluation is for 50 marks and it shall take place during I Mid-Term examination and II Mid-Term examination. The average marks of two Mid-Term examinations is the final for 50 marks. Student shall have to earn 40%, i.e 20 marks out of 50 marks from average of the two examinations. There shall be NO external evaluation. The student is deemed to have failed, if he/she (i) does not submit a report on the Project, or (ii) does not make a presentation of the same before the internal committee as per schedule, or (ii) secures less than 40% marks in this course.

7. Recounting of Marks in the End Examination Answer Books: A student can request for recounting of his/her answer book on payment of a prescribed fee.

8. Re-evaluation of the End Examination Answer Books: A student can request for re- evaluation of his/her answer book on payment of a prescribed fee.

9. Supplementary Examinations: A student who has failed to secure the required credits can register for a supplementary examination, as per the schedule announced by the College for a prescribed fee.

10. Malpractices in Examinations: Disciplinary action shall be taken in case of malpractices during Mid/ End-examinations as per the rules framed by the Academic Council.

11.Re-registration for mid examination: A student shall be given one time chance to re-register for a maximum of two subjects in a semester:

- If the internal marks secured by a student in Continuous Internal Evaluation marks for 40 (sum of average of 2 mid-term examinations, average of all assignments and Subject Viva-voce/ PPT/Poster Presentation/Case Study on a topic in the concerned subject) are less than 35% and failed in those subjects

A student must re-register for the failed subject(s) for 40 marks within four weeks of commencement of the classwork when the course is offered next, it could be semester for first years and a year for others.

In the event of the student taking this chance, his/her Continuous Internal Evaluation marks for 40 and Semester End Examination marks for 60 obtained in the previous attempt stand cancelled.

12.Academic Requirements and Promotion Rules:

a) A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course, if student secures not less than 35% (14 marks out of 40), not less than 35% (21 marks out of 60 marks) in the semester end examination, and a minimum of 40% (40 marks out of 100 marks) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

The student is eligible to write Semester End Examination of the concerned subject/course if the student scores ≥ 35% (14 marks) of 40 Continuous Internal Examination (CIE) marks.

In case, the student appears for Semester End Examination (SEE) of the concerned subject/course but not scored minimum 35% of CIE marks (14 marks out of 40 internal marks), his/her performance in that subject/course in SEE shall stand cancelled inspite of appearing the SEE.

b) A student shall be promoted to the next year only when he/she satisfies the requirements of all the previous semesters.

S.No	Promotion	Conditions to be fulfilled
1	First year first semester to First year second semester	Regular course of study of First year first semester.
2	First year second semester to Second year first semester	(i) Regular course of study of First year second semester. (ii) Must have secured at least 50% credits up to First year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3	Second year first semester to Second year second semester	Regular course of study of Second year first semester.
4	Second year second semester to Third year first semester	(i) Regular course of study of Second year second semester (ii) Must have secured at least 60% credits up to Second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	Third year first semester to Third year second semester	Regular course of study of Third year first semester.

6	Third year second semesterto Fourth year first semester	**(i)** Regular course of study of Third year second semester. **(ii)** Must have secured at least 60% credits up to Third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
7	Fourth year first semester to Fourth year second semester	Regular course of study of Fourth year first semester.

c)Provision of opting 2 OE courses through online mode.

d)Choice of placement-oriented value-added courses in every semester from II year till IV year

e)Students can take a year break after second or third year to work on R&D

f)Under Mandatory Courses

    i)Co-Curricular activities -- 0.5 credit for publishing paper, publishing patent, attend seminar, technical competition and taking part in hackathon

    ii) Extra-Curricular activities -- 0.5 credit for sports represent University or part or college winning team a medal or cup in outside recognized inter collegiate or above tournaments or NSS activities or donated blood two times or 2 green campus events

13.Grade Points: A 10 - point grading system with corresponding letter grades and percentage of marks, as given below, is followed

Letter Grade	Grade Point	Percentage of marks
O (Outstanding)	10	Marks >= 90
A+ (Excellent)	9	Marks >= 80 and Marks < 90
A (Very Good)	8	Marks >= 70 and Marks < 80
B+ (Good)	7	Marks >= 60 and Marks < 70
B (Average)	6	Marks >= 50 and Marks < 60
C (Pass)	5	Marks >= 40 and Marks < 50
F (Fail)	0	Marks < 40
Ab (Absent)	0	

Letter grade 'F' in any Course implies failure of the student in that course and no credits of the above table are earned.

Computation of SGPA and CGPA:

The UGC recommends the following procedure to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

  i) S_k the SGPA of **k^{th}** semester (1 to 8) is the ratio of sum of the product of the number of credits and grade points to the total credits of all courses registered by a student, i.e.,

$$SGPA\ (S_k) = \sum_{i=1}^{n}(C_i * G_i)/\sum_{i=1}^{n} C_i$$

Where **Ci** is the number of credits of the **ith** course and **Gi** is the grade point scored by the student in the **ith** course and **n** is the number of courses registered in that semester.

ii) The CGPA is calculated in the same manner taking into account all the courses **m**, registered by student over all the semesters of a programme, i.e., up to and inclusive of **Sk**, where **k ≥ 2**.

$$CGPA = \sum_{i=1}^{m}(C_i * G_i) / \sum_{i=1}^{m} C_i$$

iii) The SGPA and CGPA shall be rounded off to 2 decimal points.

14. Award of Class: After a student satisfies all the requirements prescribed for the completion of the Degree and becomes eligible for the award of B.Tech Degree by JNTUH, he/she shall be placed in one of the following four classes based on CGPA secured from the 160 credits.

S. No	Class Awarded	CGPA Secured
1	First Class with Distinction	CGPA >= 8.00 with no F or below grade/detention anytime during the programme
2	First Class	CGPA >= 8.00 with rest of the clauses of S.No 1 not satisfied
3	First Class	CGPA ≥ 6.50 and CGPA < 8.00
4	Second Class	CGPA ≥ 5.50 and CGPA < 6.50
5	Pass Class	CGPA ≥ 5.00 and CGPA < 5.50

Equivalence of grade to marks
Marks % = (CGPA -0.5)*10

15. Award of 2-Year B.Tech Diploma Certificate

1. A student is awarded 2-Year UG Diploma Certificate in the concerned engineering branch on completion of all the academic requirements and earned all the 80 credits (within 4 years from the date of admission) upto B. Tech. – II Year – II Semester if the student want to exit the 4-Year B. Tech. program and requests for the 2-Year B.Tech (UG) Diploma Certificate.

2. The student **once opted and awarded for 2-Year UG Diploma Certificate, the student will be permitted to join** in B. Tech. III Year – I Semester and continue for completion of remaining years of study for 4-Year B. Tech. Degree. ONLY in the next academic year along with next batch students. However, if any student wishes to continue the study after opting for exit, he/she should register for the subjects/courses in III Year I Semester before commencement of classwork for that semester.

3. The students, who exit the 4-Year B. Tech. program after II Year of study and wish to re-join the B.Tech program, must submit the 2 -Year B. Tech. (UG) Diploma Certificate awarded to him, subject to the eligibility for completion of Course/Degree.

4. A student may be permitted to take one year break after completion of II Year II Semester or B. Tech. III Year II Semester (with university permission through the principal of the college well in advance) and can re-enter the course in **next Academic Year in the same college** and complete the course on fulfilling all the academic credentials within a stipulated duration i.e. double the duration of the course (Ex. within 8 Years for 4-Year program).

16. Withholding of Results: If the student has not paid dues to the Institute/ University, or if any case of indiscipline is pending against the student, the result of the student (for that Semester) may be withheld and the student will not be allowed to go into the next semester. The award or issue of the Degree may also be withheld in such cases.

17. Transitory Regulations

A. For students detained due to shortage of attendance:

1. A Student who has been detained in I year of GR20 Regulations due to lack of attendance, shall be permitted to join I year I Semester of GR22 Regulations and he is required to complete the study of B.Tech programme within the stipulated period of eight academic years from the date of first admission in I Year.

2. A student who has been detained in any semester of II, III and IV years of GR20 regulations for want of attendance, shall be permitted to join the corresponding semester of GR22 Regulations and is required to complete the study of B.Tech within the stipulated period of eight academic years from the date of first admission in I Year. The GR22 Academic Regulations under which a student has been readmitted shall be applicable to that student from that semester. See rule (C) for further Transitory Regulations.

B. For students detained due to shortage of credits:

3. A student of GR20 Regulations who has been detained due to lack of credits, shall be promoted to the next semester of GR22 Regulations only after acquiring the required number of credits as per the corresponding regulations of his/her first admission. The total credits required are 160 including both GR20 & GR22 regulations. The student is required to complete the study of B.Tech within the stipulated period of eight academic years from the year of first admission. The GR22 Academic Regulations are applicable to a student from the year of readmission. See rule (C) for further Transitory Regulations.

C. For readmitted students in GR22 Regulations:

4. A student who has failed in any subject under any regulation has to pass those subjects in the same regulations.

5. The maximum credits that a student acquires for the award of degree, shall be the sum of the total number of credits secured in all the regulations of his/her study including GR22 Regulations. **There is NO exemption of credits in any case**.

6. If a student is readmitted to GR22 Regulations and has any subject with 80% of syllabus common with his/her previous regulations, that particular subject in GR22 Regulations will be substituted by another subject to be suggested by the college academic administration.

Note:

    If a student readmitted to GR22 Regulations and has not studied any courses/topics in his/her earlier regulations of study which is prerequisite for further subjects in GR22 Regulations, then the college shall conduct remedial classes to cover those courses/topics for the benefit of the students.

18. Transfer of students from the Constituent Colleges of JNTUH or from other Colleges / Universities:

a) Transfer of students from the Constituent Colleges of JNTUH or from other Colleges/ Universities shall be considered only on case-to-case basis.

b) There shall be no branch transfers after the completion of admission process.

c) The students seeking transfer to GRIET from various other Universities/institutions have to pass the failed courses which are equivalent to the courses of GRIET, and also pass the courses of GRIET which the students have not studied at the earlier institution. Further, though the students have passed some of the courses at the earlier institutions, if the same courses are prescribed in different semesters of GRIET, the students have to study those courses in GRIET in spite of the fact that those courses are repeated.

d) The transferred students from other Universities/institutions to GRIET who are on rolls are to be provided one chance to write the CBT (internal marks) in the **equivalent course(s)** as per the clearance (equivalence) letter issued by the University.

19. General Rules

a. The academic regulations should be read as a whole for the purpose of any interpretation.

b. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Academic Council is final.

c. In case of any error in the above rules and regulations, the decision of the Academic Council is final.

d. The college may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the college.

Academic Regulations for B.Tech (Lateral Entry) under GR22
(Applicable for Batches Admitted from 2022-23)

1. All regulations as applicable for B.Tech 4-year degree programme (Regular) will hold good for B.Tech (Lateral Entry Scheme) except for the following rules:
   a) Pursued programme of study for not less than three academic years and not more than six academic years.
   b) A student should register for all 120 credits and secure all credits. The marks obtained in all 120 credits shall be considered for the calculation of the final CGPA.
   c) Students who fail to fulfil all the academic requirements for the award of the degree within six academic years from the year of their admission, shall forfeit their seat in B.Tech programme.

2. **Academic Requirements and Promotion Rules:**
   a) A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory or laboratories if he/she secures not less than 35% of marks in the Semester-end Examination and a minimum of 40% of the sum total of the Internal Evaluation and Semester-end Examination taken together.
   b) A student shall be promoted to the next year only when he/she satisfies the requirements of all the previous semesters.

S. No.	Promotion	Conditions to be fulfilled
1	Second year first semester to Second year second semester.	Regular course of study of Second year first semester.
2	Second year second semester to Third year first semester.	(i) Regular course of study of Second year second semester. (ii) Must have secured at least 50% credits up to Second year second semesterfrom all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3	Third year first semester to Third year second semester.	Regular course of study of Third year first semester.
4	Third year second semester to Fourth year first semester.	(i) Regular course of study of Thirdyear second semester. (ii) Must have secured at least 60% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	Fourth year first semester to Fourth year second semester.	Regular course of study of Fourth year first semester.

3. **Award of Class:** After a student satisfies all the requirements prescribed for the completion of the Degree and becomes eligible for the award of B.Tech Degree by JNTUH, he/she shall be placed in one of the following four classes based on CGPA secured from the 120 credits.

S. No	Class Awarded	CGPA Secured
1	First Class with Distinction	CGPA >= 8.00 with no F or below grade/ detention anytime during the Programme
2	First Class	CGPA >= 8.00 with rest of the clauses of S.no 1 not satisfied
3	First Class	CGPA ≥ 6.50 and CGPA < 8.00
4	Second Class	CGPA ≥ 5.50 and CGPA < 6.50
5	Pass Class	CGPA ≥ 5.00 and CGPA < 5.50

Academic Regulations for B.Tech with Minors Programme under GR22
(Applicable for Batches Admitted from 2022-23)

1. **Objectives**

    The key objectives of offering B. Tech. with Minor program are:

    - To expand the domain knowledge of the students in one of the other programmes of engineering.
    - To increase the employability of undergraduate students keeping in view of better opportunity in interdisciplinary areas of engineering & technology.
    - To provide an opportunity to students to pursue their higher studies in the inter-disciplinary areas in addition to their own programme of study.
    - To offer the knowledge in the areas which are identified as emerging technologies/thrust areas of Engineering.

2. **Academic Regulations for B.Tech Degree with Minor programmes**

    a) The weekly instruction hours, internal & external evaluation and award of grades are on par with regular 4 -Years B.Tech programme.

    b) For B.Tech with Minor, a student needs to earn additional 18 credits (over and above the required 160 credits for B.Tech degree). All these 18 credits need to be completed in III year and IV year only.

    c) After registering for the Minor programme, if a student is unable to earn all the required 18 credits in a specified duration (twice the duration of the course), he/she shall not be awarded Minor degree. However, if the student earns all the required 160 credits of B.Tech, he/she will be awarded only B.Tech degree in the concerned programme.

    d) There is no transfer of credits from Minor programme courses to regular B.Tech degree course and vice versa.

    e) These 18 credits are to be earned from the additional Courses offered by the host department in the college as well as from the MOOCS platform.

    f) For the course selected under MOOCS platform following guidelines may be followed:

    i) Prior to registration of MOOCS courses, formal approval of the courses, by the University is essential. University before the issue of approval considers the parameters like the institute / agency which is offering the course, syllabus, credits, duration of the programme and mode of evaluation etc.

    ii) Minimum credits for MOOCS course must be equal to or more than the credits specified in the Minor course structure provided by the University.

    iii) Only Pass-grade/marks or above shall be considered for inclusion of grades in minor grade memo.

    iv) Any expenses incurred for the MOOCS courses are to be met by the students only.

    g) The option to take a Minor programme is purely the choice of the student.

    h) The student shall be given a choice of withdrawing all the courses registered and/or the credits earned for Minor programme at any time; and in that case the student will be awarded only B.Tech degree in the concerned programme on earning the required credits of 160.

    i) The student can choose only one Minor programme along with his/her basic engineering degree. A student who chooses an Honors programme is not eligible to choose a Minor programme and vice-versa.

    j) A student can graduate with a Minor if he/she fulfils the requirements for his/her regular B.Tech programme as well as fulfils the requirements for Minor programme.

    k) The institute shall maintain a record of students registered and pursuing their Minor programmes, minor programme-wise and parent programme -wise. The same report needs to be sent to the University once the enrolment process is complete.

l) The institute / department shall prepare the time-tables for each Minor course offered at their respective institutes without any overlap/clash with other courses of study in the respective semesters.

3. Eligibility conditions for the student to register for Minor programme

a) A student can opt for B.Tech programme with Minor programme if she/he has no active backlogs till II Year I Semester (III semester) at the time of entering into III year I semester.

b) Prior approval of mentor and Head of the Department for the enrolment into Minor programme, before commencement of III year I Semester (V Semester), is mandatory

c) If more than 50% of the students in a programme fulfil the eligibility criteria (as stated above), the number of students given eligibility should be limited to 50%.

4. Registration for the courses in Minor Programme

a) At the beginning of each semester, just before the commencement of classes, students shall register for the courses which they wish to take in that semester.

b) The students should choose a course from the list against each semester (from Minors course structure) other than the courses they have studied/registered for regular B.Tech programme. No course should be identical to that of the regular B.Tech course. The students should take the advice of faculty mentors while registering for a course at the beginning of semester.

c) The maximum No. of courses for the Minor is limited to two (three in case of inclusion of lab) in a semester along with regular semester courses.

d) The registration fee to be collected from the students by the College is **Rs. 1000/-** per one credit.

e) A fee for late registration may be imposed as per the norms.

5. Minor courses and the offering departments

S.No	Minor Programme	Eligible programme of students	@Offering Department	Award of Degree
1.	Artificial Intelligence & Machine Learning	All programmes, except B.Tech in CSE (AI&ML) /B.Tech (AI&ML)/ B.Tech (AI)/ B.Tech CSE(AI)	CSE	"B.Tech in programme name with Minor in Artificial Intelligence & Machine Learning"

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

(Autonomous)

Bachupally, Kukatpally, Hyderabad–500090, India.

B. Tech Computer Science and Engineering(Data Science) GR22 Course Structure

I B. Tech CSE(DS) - I Semester

S.No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	Maths	BS	GR22A1001	Linear Algebra and Function Approximation	3	1	0	4	3	1	0	4	40	60	100
2	Chemistry	BS	GR22A1005	Engineering Chemistry	3	1	0	4	3	1	0	4	40	60	100
3	CSE	ES	GR22A1007	Programming for Problem Solving	2	1	0	3	2	1	0	3	40	60	100
4	ME	ES	GR22A1008	Fundamentals of Electrical Engineering	2	1	0	3	2	1	0	3	40	60	100
5	Chemistry	BS	GR22A1015	EngineeringChemistry Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
6	CSE	ES	GR22A1017	Programmingfor Problem Solving Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
7	ME	ES	GR22A1021	Engineering Workshop	1	0	1.5	2.5	1	0	3	4	40	60	100
8	EEE	ES	GR22A1019	Fundamentals of Electrical Engineering	0	0	1	1	0	0	2	2	40	60	100
			TOTAL		**11**	**4**	**5.5**	**20.5**	**11**	**4**	**11**	**26**	**320**	**480**	**800**
9	Mgmt	MC	GR22A1022	Design Thinking	0	0	0	0	2	0	0	2	40	60	100

I B. Tech CSE(DS) - II Semester

S.No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	Maths	BS	GR22A1002	Differential Equations and Vector Calculus	3	1	0	4	3	1	0	4	40	60	100
2	Physics	BS	GR22A1003	Applied Physics	3	1	0	4	3	1	0	4	40	60	100
3	English	HS	GR22A1006	English	2	0	0	2	2	0	0	2	40	60	100
4	CSE	ES	GR22A1012	Data Structures	2	1	0	3	2	1	0	3	40	60	100
5	EEE	ES	GR22A1011	Graphics for Engineers	1	0	2	3	1	0	4	5	40	60	100
6	Physics	BS	GR22A1013	Applied Physics Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
7	CSE	ES	GR22A1020	Data Structures Lab	0	0	1	1	0	0	2	2	40	60	100
8	English	HS	GR22A1016	English Language and communication skills lab	0	0	1	1	0	0	2	2	40	60	100
			TOTAL		**11**	**3**	**5.5**	**19.5**	**11**	**3**	**11**	**25**	**320**	**480**	**800**

II B. Tech CSE(DS) - I Semester

S.No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	IT	PC	GR22A2067	Digital Logic Design	3	0	0	3	3	0	0	3	40	60	100
2	IT	PC	GR22A2068	Java Programming	3	0	0	3	3	0	0	3	40	60	100
3	IT	PC	GR22A2077	Design and Analysis of Algorithms	3	0	0	3	3	0	0	3	40	60	100
4	CSE	PC	GR22A2075	Discrete Mathematics	2	1	0	3	2	1	0	3	40	60	100
5	IT	PC	GR22A2069	Database Management Systems	3	0	0	3	3	0	0	3	40	60	100
6	CSE	PC	GR22A2085	Scripting Languages lab	0	0	1.5	1.5	0	0	3	3	40	60	100
7	IT	PC	GR22A2071	Java Programming Lab	0	0	2	2	0	0	4	4	40	60	100
8	IT	PC	GR22A2072	Database Management Systems Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
			TOTAL		14	1	5	20	14	1	10	25	320	480	800
9	Mgmt	MC	GR22A2002	Value Ethics and Gender Culture	0	0	0	0	2	0	0	2	40	60	100

II B. Tech CSE(DS) - II Semester

S.No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	IT	PC	GR22A2073	Computer Organization	3	0	0	3	3	0	0	3	40	60	100
2	CSE	PC	GR22A2074	Operating Systems	2	1	0	3	2	1	0	3	40	60	100
3	CSE	PC	GR22A2086	Data Science with R Programming	3	0	0	3	3	0	0	3	40	60	100
4	CSE	PC	GR22A2076	Full Stack Web Development	3	0	0	3	3	0	0	3	40	60	100
5	Maths	BS	GR22A2006	Applied Statistics for Engineers	3	0	0	3	3	0	0	3	40	60	100
6	CSE	PC	GR22A2078	Full Stack Web Development Lab	0	0	1.5	1.5	0	0	3	3	40	60	40
7	CSE	PC	GR22A2079	Operating Systems Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
8	CSE	PC	GR22A2087	Data Science with R Programming Lab	0	0	2	2	0	0	4	4	40	60	100
			TOTAL		14	1	5	20	14	1	10	25	320	480	800
9	HS	MC	GR22A2001	Environmental Science	0	0	0	0	2	0	0	2	40	60	100
10	English	MC	GR22A2108	Effective Technical Communication	0	0	0	0	2	0	0	2	40	60	100
11	CSE	MC	GR22A2109	Real-time Research Project/ Societal Related Project	0	0	2	2	0	0	4	4	50	--	50

III B. Tech CSE(DS) - I Semester

S.No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	CSE(AIML)	PC	GR22A3070	Artificial Intelligence	3	0	0	3	3	0	0	3	40	60	100
2	CSE(AIML)	PC	GR22A3069	Data Warehousing and Data mining	3	0	0	3	3	0	0	3	40	60	100
3	CSE(DS)	PC	GR22A3076	Data Visualization	3	0	0	3	3	0	0	3	40	60	100
4		PE		ProfessionaElective-I	3	0	0	3	3	0	0	3	40	60	100
5		OE		Open Elective-I	3	0	0	3	3	0	0	3	40	60	100
6	CSE(AIML)	PC	GR22A3073	Data Warehousing and Data mining Lab	0	0	2	2	0	0	4	4	40	60	100
7	CSE(AIML)	PC	GR22A3074	Artificial Intelligence Lab using python	0	0	1.5	1.5	0	0	3	3	40	60	100
8	CSE(DS)	PC	GR22A3078	Data Visualization Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
TOTAL					15	0	5	20	15	0	10	25	320	480	800

PROFESSIONAL ELECTIVE – I			
S. No.	BOS	Course Code	COURSE
1	IT	GR22A3125	Mobile Application Development
2	IT	GR22A3126	Cloud computing
3	CSE	GR22A3044	Computer Networks
4	CSE	GR22A3045	Graph Theory

OPEN ELECTIVE – I			
S. No	BOS	Course Code	Course
1	CSE(DS)	GR22A3077	Programming in Python

III B. Tech CSE(DS) - II Semester

S.No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	CSE(AIML)	PC	GR22A3140	Machine Learning	3	0	0	3	3	0	0	3	40	60	100
2	CSE	PC	GR22A3115	Automata and Compiler Design	2	1	0	3	2	1	0	3	40	60	100
3	CSE(DS)	PC	GR22A31 43	Big Data Analytics	3	0	0	3	3	0	0	3	40	60	100
4		PE		Professional Elective-II	3	0	0	3	3	0	0	3	40	60	100
5		OE		Open Elective-II	3	0	0	3	3	0	0	3	40	60	100
6	CSE(AIML)	PC	GR22A3142	Machine Learning Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
7	CSE (DS)	PC	GR22A3148	Big Data Analytics Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
8	CSE(DS)	PW	GR22A3089	Mini Project with Seminar	0	0	2	2	0	0	4	4	40	60	100
			TOTAL		14	1	5	20	14	1	10	25	320	480	800
9	Mgmt	MC	GR22A2003	Constitution of India	0	0	0	0	2	0	0	2	40	60	100

PROFESSIONAL ELECTIVE – II			
S. No.	BOS	Course Code	COURSE
1	IT	GR22A3052	Software Engineering
2	CSE(DS)	GR22A3144	Mathematical Modeling for Data Analysis
3	CSE	GR22A4048	Cryptography and Network Security
4	CSE	GR22A3146	Blockchain Technology

OPEN ELECTIVE – II			
S. No	BOS	Course Code	Course
1	CSE(DS)	GR22A3147	Internet of Things

IV B. Tech CSE(DS) - I Semester

S.No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	CSE(DS)	PC	GR22A4083	Business Intelligence	3	0	0	3	3	0	0	3	40	60	100
2	Mgmt	HS	GR22A2004	Economics and Accounting for Engineers	3	0	0	3	3	0	0	3	40	60	100
3		PE		Professional Elective-III	3	0	0	3	3	0	0	3	40	60	100
4		PE		Professional Elective-IV	3	0	0	3	3	0	0	3	40	60	100
5		OE		Open Elective- III	3	0	0	3	3	0	0	3	40	60	100
6	CSE(DS)	PC	GR22A4086	Business Intelligence Lab	0	0	2	2	0	0	4	4	40	60	100
7	CSE	PC	GR22A2080	Visual Programming using C# and .Net Lab	0	0	2	2	0	0	4	4	40	60	100
8	CSE(DS)	PW	GR22A4082	Project Work- Phase I	0	0	6	6	0	0	12	12	40	60	100
			TOTAL		**15**	**0**	**10**	**25**	**15**	**0**	**20**	**35**	**320**	**480**	**800**

PROFESSIONAL ELECTIVE – III			
S. No.	BOS	Course Code	COURSE
1	CSE (AIML)	GR22A4143	Introduction to Robotics
2	CSE (AIML)	GR22A3118	Neural Networks and Deep Learning
3	CSE (AIML)	GR22A4079	Natural Language Processing
4	CSE (DS)	GR22A4084	Semantic Web

PROFESSIONAL ELECTIVE – IV			
S. No.	BOS	Course Code	COURSE
1	CSE	GR22A4052	Information Storage and Management
2	CSE	GR22A3047	Principles of Programming Languages
3	IT	GR22A4063	Design Patterns
4	IT	GR22A4126	Software Project Management

OPEN ELECTIVE – III			
S. No	BOS	Course Code	Course
1	CSE(DS)	GR22A4085	Scripting Languages

IV B. Tech CSE(DS) - II Semester

S.No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	Mgmt	HS	GR22A3116	Fundamentals of Management and Entrepreneurship	3	0	0	3	3	0	0	3	40	60	100
2		PE		Professional Elective-V	3	0	0	3	3	0	0	3	40	60	100
3		PE		Professional Elective-VI	3	0	0	3	3	0	0	3	40	60	100
4	CSE(DS)	PW	GR22A4145	Project Work-Phase II	0	0	6	6	0	0	12	12	40	60	100
TOTAL					9	0	6	15	9	0	12	21	160	240	400

PROFESSIONAL ELECTIVE – V			
S. No.	BOS	Course Code	COURSE
1	CSE	GR22A4120	Real Time Operating Systems
2	IT	GR22A4130	Cyber Forensics
3	CSE	GR22A4121	Green Computing
4	CSE(DS)	GR22A4146	Robotic Process Automation

PROFESSIONAL ELECTIVE – VI			
S. No.	BOS	Course Code	COURSE
1	IT	GR22A4058	Software Testing Methodologies
2	CSE	GR22A4051	Image and Video Processing
3	CSE	GR22A4050	Network Routing Algorithms
4	CSE	GR22A4125	Software Product Development and Management

PROFESSIONAL ELECTIVES – 4 THREADS

S. No.	Theory and Algorithms	Applications	Data Science and Machine Intelligence	Software and Technology
PE I	Computer Networks	Mobile Application Development	Graph Theory	Cloud computing
PE II	Software Engineering	Cryptography and Network security	Mathematical Modeling for Data Analysis	Blockchain Technology
PE III	Natural Language Processing	Neural Networks and Deep Learning	Introduction to Robotics	Semantic Web
PE IV	Information Storage and Management	Principles of Programming Languages	Design Patterns	Software Project Management
PE V	Real Time Operating Systems	Cyber Forensics	Green Computing	Robotic Process Automation
PE VI	Network Routing Algorithms	Software Testing Methodologies	Image and Video Processing	Software Product Development and Management

OPEN ELECTIVES FOR GR22 REGULATIONS:

THREAD 1	THREAD 2	OFFERED BY
Soft Skills and Interpersonal Skills (GR22A3145) Human Resource Development and Organizational Behavior (GR22A4049) Cyber Law and Ethics (GR22A4077) Economic Policies in India (GR22A4147)	Data Science for Engineers (GR22A3049)	CSE
	Data Analytics using Open Source Tools (GR22A3120)	
	Augmented Reality and Virtual Reality (GR22A4054)	
	Basics of Java Programming (GR22A3072)	CSE (AIML)
	Introduction to DBMS (GR22A3141)	
	Introduction to Data Mining (GR22A4080)	
	Programming in Python (GR22A3077)	CSE (DS)
	Internet of Things (GR22A3147)	
	Scripting Languages (GR22A4085)	
	Services Science and Service Operational Management (GR22A4134)	CSBS
	IT Project Management (GR22A4135)	
	Marketing Research and Marketing Management (GR22A4136)	
	Introduction to Data Science (GR22A3056)	IT
	User Centric Human Computer Interaction (GR22A3127)	
	Design Patterns (GR22A4063)	
	Non Conventional Energy Sources (GR22A3019)	EEE
	Concepts of Control Systems (GR22A3095)	
	Artificial Neural Networks and Fuzzy Logic (GR22A4022)	
	Principles of Communications (GR22A3040)	ECE
	Sensor Technology (GR22A3113)	
	Communication Technologies (GR22A4045)	
	Industrial Automation and Control (GR22A3030)	ME
	Composite Materials (GR22A3105)	
	Operations Research (GR22A3018)	
	Engineering Materials for Sustainability (GR22A3009)	CE
	Geographic Information Systems and Science (GR22A3086)	
	Environmental Impact Assessment (GR22A4011)	
	Basics of Java Programming (GR22A3072)	CSE (AI)
	Introduction to DBMS (GR22A3141)	
	Introduction to Data Mining (GR22A4080)	
	Introduction to Data Science (GR22A3056)	CSIT
	User Centric Human Computer Interaction (GR22A3127)	
	Design Patterns (GR22A4063)	

I YEAR
I SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

LINEAR ALGEBRA AND FUNCTION APPROXIMATION

Course Code: GR22A1001   **L/T/P/C: 3/1/0/4**
I Year I Semester

Prerequisites: Elementary knowledge of vectors, matrices and pre-calculus

Course Outcomes
1. Work with the essential tools of vector and matrix algebra
2. Compute eigenvalues and vectors for engineering applications
3. Illustrate matrix decomposition techniques to determine the exact or approximatesolutions of a linear algebraic system.
4. Develop the skill of finding multivariable function optima
5. Illustrate the concepts of function approximation with measurement of error

UNIT I
Fundamentals of Vector and Matrix algebra
Operations on vectors and matrices- Orthogonal projection of vectors- Exact and generalized inverse of a matrix- Rank of a matrix- Linear independence of vectors- Structured square matrices (Symmetric, Hermitian, skew-symmetric, skew-Hermitian, orthogonal and unitary matrices)- Vector and matrix norms Solution of a linear algebraic system of equations (homogeneous and non-homogeneous) using Gauss elimination

UNIT II
Matrix eigenvalue problem and Quadratic forms
Determination of eigenvalues and eigenvectors of a matrix, properties of eigenvalues and eigenvectors (without proof)- Similarity of matrices- Diagonalization of a matrix- Orthogonal diagonalization of a symmetric matrix- Definiteness of a symmetric matrix.
Quadratic Forms- Definiteness and nature of a quadratic form- Reduction of a quadratic form to the canonical form using an orthogonal transformation

UNIT III
Matrix decomposition and Least squares solution of algebraic systems
LU decomposition- Cholesky decomposition- Gram-Schmidt orthonormalization process- QR factorization- Eigen decomposition of a symmetric matrix- Singular value decomposition.
Least squares solution of an over determined system of equations using QR factorization and the generalized inverse- Estimation of the least squares error

UNIT IV
Multivariable differential calculus and Function optimization
Partial Differentiation- Chain rule- Total differentiation- Jacobian- Functional dependence . Multivariable function Optimization-Taylor's theorem for multivariablefunctions- Unconstrained optimization of functions using the Hessian matrix- Constrained optimizationusing the Lagrange multiplier method

UNIT V
Function approximation tools in engineering
Function approximation using Taylor's polynomials- Properties of Chebyshev polynomials- Uniform approximation using Chebyshev polynomials The principle of least squares- Function approximation using polynomial, exponential and powercurves using matrix notation- Estimating the Mean squared error

Text Books:
1. Advanced Engineering Mathematics, 5th edition, R.K.Jain and S.R.K.Iyengar, Narosapublishing house
2. Higher Engineering Mathematics- B.S.Grewal- Khanna publications

Reference Books:
1. Introduction to Linear Algebra, Gilbert Strang, 5th edition, Wellesley,2017.
2. Numerical methods for scientific and engineering computation, M.K.Jain, S.R.K.Iyengar,R.K.Jain- 3rd edition- New Age publishers
3. Applied Mathematics, Vol. I & II, P. N. Wartikar and J. N. Wartikar, Pune VidyarthiGriha Prakashan,2010

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGINEERING CHEMISTRY

Course Code: GR22A1005   **L/T/P/C: 3/1/0/4**
I Year I Semester

Course Outcomes:

1. Analyze microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
2. Relate electromagnetic spectra used for exciting different molecular energy levels in various spectroscopic techniques and their application in medicine and other fields.
3. Recognize various problems related to electrochemistry and corrosion in industry and is able to explain different prevention techniques and apply concepts of chemistry in engineering.
4. Know the origin of different types of engineering materials used in modern technology and interpret different problems involved in industrial utilization of water.
5. Understand the processing of fossil fuels for the effective utilization of chemical energy.

UNIT I
Atomic and Molecular Structure

Atomic and Molecular orbitals - Definition, examples and comparison, Molecular orbital theory-postulates and MO energy diagrams of N_2 and O_2.

Theories of Metallic bonding – Free electron theory, Resonance theory, Molecular orbital theory, Valence Bond Theory – Postulates and Limitations, Bonding in $[Ni(CO)4]$, $[Ni(Cl)4]^{2-}$, $[Ni(CN)4]^{2-}$, $[Co(NH3)6]^{3+}$, and $[CoF6]^{3-}$. Crystal Field Theory, Crystal Field Splitting of transition metal ion d-orbitals in octahedral, tetrahedral and square planar geometries.

UNIT II
Spectroscopic Techniques and Applications

Regions of Electromagnetic spectrum. Molecular spectroscopy: Rotational Spectroscopy: Rotation of molecules, Rotational spectra of rigid diatomic molecules, Selection rules.
Vibrational Spectroscopy: The vibrating diatomic molecule, Simple and anharmonic oscillators of a diatomic molecule, Selection rules, Applications of IR spectroscopy.
NMR Spectroscopy: Criteria for NMR activity (Magnetic and non-magnetic nuclei), Basic concepts and Principle of ^1H NMR spectroscopy, Chemical shift- Shielding and Deshielding. Magnetic Resonance Imaging.

UNIT III
Batteries and Corrosion

Batteries: Primary and Secondary types, Lithium ion and Lead acid batteries. Fuel cells: Definition, Hydrogen-Oxygen fuel cell and Microbial Fuel cell – working principle and applications.
Corrosion: Definition, causes and effects of corrosion, Theories of chemical and electro chemical corrosion with mechanism, Differential metal corrosion - Galvanic corrosion, Differential aeration corrosion - pitting corrosion, Factors affecting corrosion – Nature of metal (Position of metal, Relative areas, Purity and Passivity), Nature of Environment (pH, Temperature and Humidity), Corrosion control methods: Cathodic protection (sacrificial anodic and impressed current cathodic protection), Metallic coatings: Hot dipping- galvanization and tinning.

UNIT IV
Engineering Materials and Water Technology

Semiconductors: Si and Ge - preparation, purification and crystal growth by zone refining and Czochralski pulling methods, Doping – Epitaxy, Diffusion and Ion implantation.

Plastics: Comparison between thermoplastics and thermosets, Fabrication of plastics - compression moulding and injection moulding. Conducting polymers – Definition, classificationand applications.

Water: Hardness - Causes, types and units. Boiler troubles-scales and sludges, caustic embrittlement.

Water purification: Demineralization by Ion-exchange process, Desalination by reverse osmosis method.

UNIT V

Stereochemistry and Energy Resources

Stereochemistry: Elements of symmetry-plane of symmetry, centre of symmetry, alternating axis of symmetry. Chirality, Enantiomers – tartaric acid, Diastereomers- 2,3-dichloropentane, Conformational analysis of n-butane. Structure, synthesis and pharmaceutical applications of aspirin and ibuprofen.

Energy sources: Fossil Fuels: Coal –types, analysis of coal- proximate and ultimate analysis and their significance, Petroleum-its composition, Cracking – Definition, Fluid bed catalytic cracking, Knocking and its mechanism in Internal Combustion engine, Octane rating, Hydrogen gas generation by Electrolysis process.

Text Books:
1. Engineering chemistry by P.C. Jain and M. Jain; Dhanpat Rai Publishing Company (P)Ltd., New Delhi.
2. Textbook of Engineering Chemistry by A. Jayashree, Wiley Publications

Reference Books:
1. Organic Chemistry by Morrison, Boyd & Bhattacharjee (Pearson Pubs)
2. Engineering Chemistry by O.G.Palanna, Tata McGraw Hills Private Ltd.
3. Fundamentals of Molecular Spectroscopy, by C.N. Banwell. McGraw Hill Publication
4. A Textbook of Engineering Chemistry by Shashi Chawla, Dhanpat Rai PublishingCompany (P) Ltd., New Delhi.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
PROGRAMMING FOR PROBLEM SOLVING

Course Code: GR22A1007   **L/T/P/C: 2/1/0/3**
I Year I Semester

Course Outcomes:
1. To design algorithms and flowcharts for problem solving and illustrate the fundamentals of C language.
2. To identify and apply control structures and arrays to solve problems.
3. To discover the need for strings and functions in problem solving and apply it.
4. To analyze the need for pointers and structures in C and implement for solutions.
5. To interpret working with files, preprocessor directives and command line arguments in C.

UNIT I
Introduction to Programming: Introduction to Algorithms: Representation of Algorithm, Flowchart, Pseudo code with examples, compiling and executing programs, syntax and logical errors.
Introduction to C Programming Language: Structure of C program, Keywords, Variables, Constants, Datatypes, Operators, Precedence and Associativity, Expression evaluation, Implicit and Explicit Type conversion, Formatted and Unformatted I/O.

UNIT II
Decision Making and Arrays: Branching and Loops: Conditional branching with simple if, if-else, nested if else, else if ladder, switch-case, loops: for, while, do-while, jumping statements: goto, break, continue, exit.
Arrays: one and two dimensional arrays, creating, accessing and manipulating elements of arrays
Searching: Introduction to searching, Linear search and Binary search.

UNIT III
Strings and Functions:
Functions: Introduction to structured programming, Function Declaration, Signature of a function, Parameters and return type of a function, Categories of functions, Parameter passing techniques, Passing arrays and strings to functions, Recursion, merits and demerits of recursive functions, Storage classes.
Strings: Introduction to strings, operations on characters, Basic string functions available in C - strlen, strcat, strcpy, strrev,strcmp , String operations without string handling functions, Arrays of strings.

UNIT IV
Pointers and Structures: Pointers: Idea of pointers, Declaration and initialization of pointers, Pointer to pointer, Void pointer, Null pointer, Pointers to Arrays and Structures, Function pointer.
Structures and unions: Defining structures, Declaring and Initializing structures, Arrays within structures, Array of structures, Nested structures, Passing structures to functions, Unions,Typedef.

UNIT V
File handling and Preprocessor in c: Files: Text and Binary files, Creating, Reading and Writing text and binary files, Random access to files, Error Handling in files.
Preprocessor: Commonly used Preprocessor commands like include, define, undef, if, ifdef, ifndef, elif, Command line arguments, Enumeration data type.

Text Books:
1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, CengageLearning, (3rd Edition)

Reference Books:
1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, PrenticeHallof India
2. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
3. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
4. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

FUNDAMENTALS OF ELECTRICAL ENGINEERING

Course Code: GR22A1008　　　　　　　　　　　　　　　　　　**L/T/P/C: 2/1/0/3**
I Year I Semester

Course Outcomes
1. Summarize Understand basic electric circuits.
2. Analyze electric circuits with suitable theorems.
3. Interpret the working principle of Electrical machines.
4. Solve single phase balanced sinusoidal systems.
5. Apply sensors for real time applications

UNIT I
BASIC COMPONENTS AND ELECTRIC CIRCUITS
Charge, Current, Voltage, Power, Passive components, Voltage and Current sources, dependent and independent sources, fundamentals of circuit Laws, Source Transformation, Passive components in series and parallel, Delta – star conversion.

UNIT II
NETWORK ANALYSIS
Nodal and Mesh Analysis, Linearity and Superposition, Thevenin's and Norton's theorems, Maximum power transfer theorem and Reciprocity theorem.

UNIT III
A.C CIRCUITS
Representation of sinusoidal waveforms, average and rms values, phasor representation, real power, reactive power, apparent power, power factor, analysis of RL, RC and RLC circuits. Series and Parallel Circuits, Resonance.

UNIT IV
BASICS OF ELECTRICAL MACHINES
Transformer: Mutual Induction, construction and working principle, Types of transformers, Ideal transformer, EMF Equation, Phasor diagram on No Load.
Construction and working principles of DC generator, DC motor, Synchronous generator, and Induction Motor – applications.

UNIT V
MEASURING INSTRUMENTS AND SENSORS
Transducers, Sensors, and Actuators – Physical Principles and their working
Temperature Sensors, Ultrasonic Sensor, Accelerometers Sensor and PIR Motion Detector.

Text Books:
1. D.P. Kothari and I.J. Nagrath, Basic Electrical Engineering -, Third edition 2010, TataMcGraw Hill.
2. Sensors and amp, Transducers – D. Patranabis, PHI Publications
3. Electrical Engineering Fundamentals, Vincent Deltoro, Second Edition, Prentice HallIndia, 1989

Reference Books:
1. C. K. Alexander and M. N. O. Sadiku, "Electric Circuits", McGraw Hill Education,2004.
2. K. V. V. Murthy and M. S. Kamath, "Basic Circuit Analysis", Jaico Publishers, 1999.

3. Circuit Theory (Analysis and Synthesis) by A.Chakrabarti-Dhanpat Rai & Co.
4. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
5. D.C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
6. Electrical and Electronics Technology, E. Hughes, 10th Edition, Pearson, 2010

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGINEERING CHEMISTRY LAB

Course Code: GR22A1015   **L/T/P/C: 0/0/3/1.5**

I Year I Semester

Course Outcomes:

1. Ability to perform experiments illustrating the principles of chemistry relevant to thestudy of science and engineering.
2. Determination of parameters like hardness and chloride content in water, measurement ofredox potentials and conductance.
3. Understand the kinetics of reactions from a change in concentrations of reactants orproducts as a function of time.
4. Synthesize a drug molecule as an example of organic synthesis methods widely used inindustry.
5. Determination of physical properties like adsorption and viscosity.

List of Experiments:

1. Determination of Total Hardness of water by complexometric method using EDTA

2. Determination of Chloride content of water by Argentometry

3. Redox titration: Estimation of Ferrous ion using standard KMnO4 by Permanganometry

4. Estimation of HCl by Conductometric titrations

5. Estimation of Ferrous ion by Potentiometry using dichromate

6. Determination of Rate constant of acid catalyzed reaction of methyl acetate

7. Adsorption of Acetic acid by charcoal

8. Determination of Surface tension of liquid by using Stalagmometer

9. Determination of Viscosity of liquid by using Ostwald's Viscometer

10. Determination of Partition Coefficient of Acetic acid between n-butanol and water

11. Synthesis of Aspirin

12. Synthesis of Paracetamol

Reference Books:

1. Vogel's text book of Practical organic chemistry, 5th Edition.
2. Senior Practical Physical Chemistry, B.D. Khosala, A. Gulati and V. Garg (R. Chand &Co., Delhi)
3. Text book on experiments and Calculations in Engineering Chemistry-S.S.Dara.
4. An introduction to practical chemistry, K.K. Sharma and D.S. Sharma (VikasPublications, New Delhi)

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PROGRAMMING FOR PROBLEM SOLVING LAB

Course Code: GR22A1017   **L/T/P/C: 0/0/3/1.5**
I Year I Semester

Course Outcomes:
1. Translate algorithms into a working program and analyse and debug the codes using basics of C language.
2. Develop programs by choosing appropriate control structures.
3. Select and apply the concept of arrays and strings for problem solving.
4. Demonstrate problem solving using modular programming and pointers.
5. Solve the problems using structures, files and pre-processor directives.

TASK 1
a. Write a C program to convert days into years, weeks and days.(Assume a year has 365days).
b. Write a C program to find greatest and smallest among three numbers using conditionaloperator.
c. Write a C program to enter P, T, R and calculate Compound Interest.

TASK 2
a. Write a C program to swap two numbers using the following.
    (i) Using third variable.
    (ii)Without using third variable
   (iii)Using bitwise operators.
b. Write a C program to do the following using Implicit and Explicit type conversion.
    (i) Convert Celsius temperature to Fahrenheit.
    (ii) Convert Fahrenheit temperature to Celsius.
    (ii)Find area of a triangle given sides a,b,c.

TASK 3
a. Write a C program to add two numbers without using arithmetic operators in C.
b. Write a C program to determine whether a number is a power of 2 or not using bitwiseoperator and ternary operator.
c. Write a C program to check whether a number is even or odd using bitwise operatorand ternary operator.

TASK 4
a. Write a C program to find the roots of a quadratic equation using if-else.
b. Write a C program to input electricity unit charges and calculate total electricity billaccording to the given condition:
For first 50 units Rs. 0.50/unit For next 100 units Rs. 0.75/unitFor next 100 units Rs. 1.20/unitFor unit above 250 Rs. 1.50/unit An additional surcharge of 20% is added to the bill
c. Write a menu driven C program to implement a simple arithmetic calculator.
d. Write a C program to display number of days in month using switch case (The input ismonth number 1 - 12).

TASK 5
a. Write a C Program check whether a given number is Perfect number or not.
b. Write a C Program check whether a given number is Palindrome number or not.
c. Write a C Program check whether a given number is Armstrong number or not.
d. Write a C Program check whether a given number is Strong number or not.

.TASK 6

a. Write a C program to display the following patterns.

(i)	(ii)	(iii)
* * * *	1	1
* *	2 3	2 2
* *	4 5 6	3 3 3
* * * *	7 8 9 10	4 4 4 4

b. Write a C program to generate the prime numbers between x and y where x and y are starting and ending values to be supplied by the user.

c. Write a C program to calculate the Sum of following series:

(i) $S1 = 1 + x/1! - x^2/2! + x^3/3! - x^4/4! + \dots xn/n!$

(ii) $S2 = x^1/1 + x^3/3 + x^5/5 + \dots + x^n/n$

TASK 7

a. Write a C program to find sum, average and minimum and maximum in a list of numbers.

b. Write a C program to implement Linear search.

c. Write a C program to implement Binary search.

TASK 8

a. Write a C program to implement Matrix Addition.

b. Write a C program to implement Matrix Multiplication.

TASK 9

a. Write a C program to implement the following with and without string functions.
    (i)Reverse a String   (ii) Concatenate 2 Strings.

b. Write a C program to read a string and determine whether it is palindrome or not.

c. Write a C program to sort the 'n' strings in the alphabetical order.

TASK 10

a. Write a C program to display binary equivalent of a given decimal number using functions.

b. Write a C program to implement transpose of a matrix using functions

c. Write a C program using functions that compares two strings to see whether they are identical or not. The function returns 1 if they are identical, 0 otherwise.

TASK 11

a. Write a C program to implement factorial of a given integer using recursive and non-recursive functions.

b. Write a C program to find the GCD (greatest common divisor) of two given integers using recursive and non-recursive functions.

c. Write a C program to print first 'n' terms of Fibonacci series using recursive and non-recursive functions.

TASK 12

a. Write a C program to implement function pointer to find sum and product of two numbers.

b. Write a C program to sort list of numbers using pointers.

TASK 13

a. Define a structure student, to tore the following data about a student: rollno(int),name(string) and marks. Suppose that the class has 'n' students. Use array oftype student and create a function to read the students data into the array. Your program should be menu driven that contains the following options :
  - (i)   Print all student details.
  - (ii) Search student by rollno.
  - (iii) Print the names of the students having the highest test score.

b. Write a C program that uses structures and functions to perform addition and product oftwo complex numbers? (use structures and functions)

TASK 14

a. Write a C program to merge two files into a third file.

b. Write a C program to count number of characters in a file and also convert all lowercase characters to upper case and display it

c. Write a C program to append a file and display it.

TASK 15

a. Write a C program to find sum of n numbers using command line arguments.

b. Write a C program to implement following pre-processor directives.i.define ii.undef iii.ifdef iv.ifndef.

c. Write a C program to create a user defined header file to find sum, product and greatestof two numbers.

Text Books:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, CengageLearning, (3rd Edition)

Reference Books:

1.   Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, PrenticeHall of India
2.   R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
3.   Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
4.   Herbert Schildt, C: The Complete Reference, McGraw Hill, 4th Edition

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGINEERING WORKSHOP

Course Code: GR22A1021   **L/T/P/C: 1/0/ 3/2.5**
I Year I Semester

Course Outcomes
1. Develop various trades applicable to industries / Manufacturing practices.
2. Create Hands on experience for common trades.
3. Improve to fabricate components with their own hands.
4. Develop practical knowledge on the dimensional accuracies and dimensional tolerances possible with various manufacturing processes.
5. To build the requirement of quality of work life on safety and organizational needs.

TRADES FOR EXERCISES: At least two exercises from each trade:

1.   Carpentry

2.   Fitting Shop

3.   Tin-Smithy

4.   Casting

5.   Welding Practice

6.   House-wiring

7.   Black Smithy

8.   **VIDEO LECTURES**: Carpentry, Fitting operations, Tin-Smithy, Casting, Welding, Electrical and Electronics, Black Smithy, Plumbing, Power tools in construction and Wood Working, Manufacturing Methods,

Text Books:
1.   Workshop Practice /B. L. Juneja / Cengage
2.   Workshop Manual / K. Venugopal /Anuradha.

References:
1.   Work shop Manual - P. Kannaiah/ K. L. Narayana/SciTech
2.   Workshop Manual / Venkat Reddy/BSP
3.   Workshop Manual/K. Venugopal/Dr.V. Prabhu Raja/G.Sreekanjan

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

FUNDAMENTALS OF ELECTRICAL ENGINEERING LAB

Course Code: GR22A1019   **L/T/P/C: 0/0/2/1**
I Year I Semester

Course Outcomes:
1. Get an exposure to common electrical components and their ratings.
2. Get an exposure to basic electrical laws.
3. Understand the measurement and relation between the basic electrical parameters
4. Understand the response of different types of electrical circuits to different excitations.
5. Compare the basic characteristics of Electrical machines

TASK-1
Verification of Ohms Law, KVL and KCL

TASK-2
Verification of Thevenin's and Norton's Theorems

TASK-3
Verification of Superposition and Reciprocity Theorems.

TASK-4
Verification of Maximum Power Transfer Theorem

TASK-5
Resonance in series RLC circuit

TASK-6
Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)

TASK-7
Three Phase Transformer: Verification of Relationship between Voltages andCurrents (Star-Delta, Delta-Delta, Delta-star, Star-Star)

TASK-8
Measurement of Active and Reactive Power in a balanced Three-phase circuit

TASK-9
Torque Speed Characteristics of a Separately Excited DC Shunt Motor

TASK-10
Torque-Slip Characteristics of a Three-phase Induction Motor

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DESIGN THINKING

Course Code: GR22A1022   **L/T/P/C: 2/0/0/0**
I Year I Semester

Course Outcomes
1. To find various DT mindsets
2. Students will be able to extend DT methodology towards defining the problem
3. Students will be able to Identify Tools for Innovation
4. Students will be able to develop Empathy Maps
5. Students will be able to build Prototypes

UNIT I
Introduction to Design Thinking: LRI Assessment, Introduction to Design Thinking, Understanding the Mindsets-Empathy, Optimism, Embrace Ambiguity, Make it, Learn from Failure, Iterate, Create Confidence, Creativity Convergent & Divergent Thinking

UNIT II
Design Thinking Methodology: The 5 Stages of the Design Thinking Process- Empathise, Define (the problem), Ideate, Prototype, and Test,

UNIT III
Ideation tools & exercises. Sample Design Challenge, Design Challenge Themes, Story telling and Tools for Innovation and creativity.

UNIT IV
Empathize-Understand customers, Empathy Maps, Empathise-Step into customers shoes-Customer Journey Maps, Define- Analysis & Drawing Inferences from Research

UNIT V
The Design Challenge: Define the Design Challenge, Prototyping & Iteration- Feasibility Study,Testing- Documentation and the Pitching

Textbook:
1. Design Thinking for Strategic Innovation: What They Can't Teach You at Business or DesignSchool - Idris Mootee.

Reference Books:
1. Zero to One: Note on Start-Ups, or How to Build the Future
2. The Lean Startup: How Constant Innovation Creates Radically Successful Businesses
    Start With Why: How Great Leaders Inspire Everyone To Take Action

I YEAR
II SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

Course Code: GR22A1002   **L/T/P/C: 3/1/0/4**
I Year II Semester

Course Outcomes
1. Classify the differential equations of first order and solve them analytically
2. Solve linear differential equations of higher order under various forcing functions
3. Evaluate double and triple integrals and apply them to some problems in geometry
4. Apply principles of vector differentiation and line integration for some field relatedproblems
5. Apply classical vector integral theorems for fast evaluation of work done around closedcurves and flux across closed surfaces

UNIT I
ORDINARY DIFFERENTIAL EQUATIONS OF THE FIRST ORDER
Linear Differential Equations of the first order: Solution of Exact, Linear and Bernoulli equations, modelling Newton's law of cooling, growth and decay models, modelling of R-L circuit

UNIT II
ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER
Solution of homogeneous and non-homogeneous linear differential equations with constant coefficients, complimentary functions, particular integrals and the method of variation of parameters
Solution of Linear Differential Equations with variable coefficients: Cauchy's and Legendre's homogeneous equations

UNIT III
MULTIPLE INTEGRALS
Double integrals: Evaluation of Double Integrals, change of order of integration (only Cartesian form), change of variables (Cartesian and polar coordinates) Triple Integrals: Evaluation of triple integrals,Change of variables (Cartesian to Spherical and Cylindrical polar coordinates) Application of double integral to find the area of a lamina and volume of a solid, application ofthe triple integral to find the volume of a solid

UNIT IV
VECTOR DIFFERENTIATION AND LINE INTEGRATION
Vector differentiation: Scalar and vector point functions, Concepts of gradient, divergence   and curl of functions in Cartesian framework, solenoidal field, irrotational field, scalar potential Vector line integration: Evaluation of the line integral, concept of work done by a force field,Conservative fields

UNIT V
SURFACE INTEGRATION AND VECTOR INTEGRALTHEOREMS
Surface integration: Evaluation of surface and volume integrals, flux across a surface
Vector integral theorems: Green's, Gauss and Stokes theorems (without proof) and their applications

Text Books:
1. R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics, Narosapublishing house, Fourth edition 2014
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition,2010
3. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley &Sons, 2006
4. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition,Pearson, Reprint, 2002.

Reference Books:
1. GRIET reference manual
2. Paras Ram, Engineering Mathematics, 2nd Edition, CBS Publishes
3. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
4. Calculus Early Transcendental 9E by James Steward, Daniel Clegg, Saleem Watson, CENGAGE Publications

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

APPLIED PHYSICS

Course Code: GR22A1003   **L/T/P/C: 3/1/0/4**
I Year II Semester

Course Outcomes:
1. Solve engineering problems involving quantum nature of radiation and matter waves.
2. Describe the characteristics of semiconductor devices such as transistors and diodes.
3. Illustrate the operation of optoelectronic devices and its applications.
4. Analyze the properties of Laser and its propagation in different types of optical fibers.
5. Identify dielectric, magnetic and superconducting materials based on their properties forspecific applications.

UNIT I
Quantum Mechanics: Introduction, Black body radiation, Planck's law, Photoelectric effect- Einstein's Photoelectric equation, Compton effect, Wave-Particle duality: de Broglie hypothesis, Davisson and Germer experiment, Heisenberg's uncertainty principle, Born's interpretation of the wave function, Schrodinger's time independent wave equation, Particle in one dimensional infinite potential box.

UNIT II
Semiconductor Physics: Intrinsic and extrinsic semiconductors, Estimation of carrier concentration in intrinsic and Extrinsic semiconductors, Dependence of Fermi level on carrier concentration and variation with temperature, Carrier transport: diffusion and drift, p-n junction diode: I-V Characteristics, Zener diode: I-V Characteristics, Hall Effect and its applications.

UNIT III
Optoelectronic Devices: Radiative transitions: Absorption, Spontaneous and Stimulated emissions, Non-radiative transitions: Auger recombination, Surface recombination and recombination at defects, Generation and recombination mechanism in semiconductors, Principle, Construction, Working, Characteristics and Applications: LED, PIN photo detector, Avalanche photo detector and Solar cell.

UNIT IV
Lasers: Introduction, Characteristics of lasers, Lasing action, Essential components of laser, Construction and working: Ruby laser, He-Ne laser and Semiconductor laser, Applications of lasers.
Fiber Optics: Introduction, Principle and Structure of an optical fiber, Basic components in optical fiber communication system, Comparison of optical fibers over conventional cables, Types of optical fibers, Acceptance angle-Numerical aperture, Losses associated with optical fibers, Applications of optical fibers.

UNIT V
Dielectric Materials: Introduction, Types of polarizations: Electronic, Ionic and Orientation, Calculation of Electronic and Ionic polarizability, Internal fields in solids, Clausius-Mossotti equation, Applications of dielectric materials.
Magnetic Materials: Introduction, Bohr magneton, classification of magnetic materials: Ferro, Para, Dia, Antiferro and Ferri, Hysteresis curve based on domain theory, Soft and hard magnetic materials, Applications of magnetic materials.

Teaching methodologies:
- White board and marker
- Power Point Presentations
- Video lectures

Text books:
1. Engineering Physics, B.K. Pandey, S. Chaturvedi – Cengage Learing.
2. Applied Physics, T. Bhīma Sankaram, BSP Publishers.
3. Engineering Physics, P.K Palanisamy, Scitech Publishers.
4. A textbook of Engineering Physics, Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar - S.Chand.

Reference Books:
1. Fundamentals of Semiconductor Devices, Second Edition, Anderson and Anderson,McGraw Hill.
2. J. Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw- Hill Inc.(1995)
3. Semiconductor Physics and Devices, 4e, Neamen and Biswas, McGraw Hill.
4. Online Course: "Optoelectronic Materials and Devices" by Monica Katiyar and DeepakGuptha on NPTEL.
5. Halliday and Resnick, Physics – Wiley.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGLISH

Course Code: GR22A1006   **L/T/P/C : 2/0/0/2**
I Year II Semester

Course Outcomes:
1. Use English Language effectively in spoken and written forms.
2. Comprehend the given texts and respond appropriately.
3. Communicate confidently in various contexts and different cultures.
4. Acquire proficiency in English including reading and listening comprehension, writingand speaking skills.
5. Listen and respond appropriately.

UNIT I
Where the Mind is without Fear poem by Rabindranath Tagore
Vocabulary: The Concept of Word Formation -- The Use of Prefixes and Suffixes.
Grammar: Identifying Common Errors in Writing with Reference to Articles and Prepositions.
Reading: Reading and Its Importance- Techniques for Effective Reading
Writing: Sentence Structures -Use of Phrases and Clauses in Sentences-Importance of Proper Punctuation - Techniques for writing precisely - Paragraph writing - Do's and Don'ts of Paragraph Writing - Creating Coherence-Organizing Principles of Paragraphs in Documents.

UNIT II
The Last Leaf by O. Henry Vocabulary: Synonyms and Antonyms.
Grammar: Modal Auxiliaries **-** Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.
Reading: Sub-skills of Reading- Skimming and Scanning
Writing: Précis Writing, Describing Objects, Places and Events – Classifying - ProvidingExamples or Evidence

UNIT III
'Blue Jeans' from the prescribed textbook 'English for Engineers' published byCambridge University Press.
Vocabulary: Acquaintance with Prefixes and Suffixes from Foreign Languages in English to form Derivatives-Words from Foreign Languages and their Use in English.
Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiersand Tenses.
Reading: Improving Comprehension Skills – Techniques for Good Comprehension
Writing: Format of a Formal Letter-Writing Formal Letters E.g. Letter of Complaint, Letter of Requisition and Letter of permission, Use of phrases for formal and informal letter writing and Email etiquette

UNIT IV
'What Should You Be Eating' from the prescribed textbook 'English for Engineers'published by Cambridge University Press.
Vocabulary: Standard Abbreviations in English and Phrasal Verbs **Grammar:** Redundancies and Clichés in Oral and Written communication.
Reading: Comprehension**-** Intensive Reading and Extensive Reading
Writing: Writing Introduction and Conclusion -Essay Writing- Argumentative andDiscursive essay – Picture Composition

UNIT V

'How a Chinese Billionaire Built Her Fortune' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary: One Word Substitutes, Technical vocabulary and their usage

Grammar: Common Errors in English

Reading: Reading Comprehension-Exercises for Practice

Writing: What is Report Writing - Technical Reports vs General Reports – Importance of Report Writing – Structure and characteristics of Report Writing - Relevance of Reports to Engineers

Text Books:

1. Sudarshana, N.P. and Savitha, C. (2018). English for Engineers. Cambridge UniversityPress.

References:

1. Swan, M. (2016). Practical English Usage. Oxford University Press.
2. Kumar, S and Lata, P. (2018). Communication Skills. Oxford University Press.
3. Wood, F.T. (2007). Remedial English Grammar. Macmillan.
4. Zinsser, William. (2001). On Writing Well. Harper Resource Book.
5. Hamp-Lyons, L. (2006). Study Writing. Cambridge University Press.
6. Exercises in Spoken English. Parts I –III. CIEFL, Hyderabad. Oxford University Press.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DATA STRUCTURES

Course Code: GR22A1012   **L/T/P/C:2/1/0/3**
I Year II Semester

Course Outcomes:
1. Implement various sorting techniques and analyze the computational complexity of algorithms.
2. Analyze the basics of data structures and its types and translate to programs the operations on Stack and Queue and their applications.
3. Develop algorithms for various operations on linked lists and convert them to programs.
4. Interpret operations on non-linear data structure Binary tree and BST.
5. Summarize the operations on graphs and apply graph traversals techniques and outline hashing techniques.

UNIT I
Sorting: Bubble sort, Insertion Sort, Selection Sort, Quick Sort, Merge Sort, Radix Sort, Counting sort.
Algorithms: Analysis of algorithms, Basic concept of order of complexity, Asymptotic Notations: Big Oh notation, Omega notation, Theta notation, little oh notation and little omega notation.

UNIT II
Stacks: Introduction to Data Structures and types, Stack – Operations: pop, push, display, peek, Representation and Implementation of stack operations using Arrays, Stack Applications, Recursion, In - fix- to postfix Transformation, Evaluating Post-fix Expressions.
Queues: Queue – Operations: Enqueue, Dequeue, display, Representation and Implementation of Queue operations using array, Applications of Queues, Circular Queues - Representation and Implementation.

UNIT III
LIST: Introduction, Dynamic memory allocation, Self-referential structures ,single linked list, Advantages and disadvantages of single linked list ,single linked list VS Arrays, representation of a linked list in memory, Operations-insertion, deletion, display, search, Implementation of stack, queue using linked list. Circular linked list, Double linked list.

UNIT IV
TREES: Basic tree concepts, **Binary Trees:** Properties, types, Representation of Binary Trees using arrays and linked lists, Binary Search Tree –Representation and Implementation of operations, Binary Search Tree Traversals (recursive), Creation of binary tree and BST from given traversals.

UNIT V
Graphs: Definition, Basic Terminology, Representation of Graphs, Graph Traversal Techniques –Breadth First Traversal, Depth First Traversal. Introduction to Hashing techniques and examples (no implementation).

TEXT BOOKS:
1. Data Structures, 2/e, Richard F, Gilberg, Forouzan, Cengage
2. Data Structures and Algorithms, 2008,G.A.V.Pai, TMH

REFERENCE BOOKS:

1. Data Structure with C, Seymour Lipschutz, TMH
2. Classic Data Structures, 2/e, Debasis , Samanta,PHI,2009
3. Fundamentals of Data Structure in C, 2/e, Horowitz, Sahni, Anderson Freed, UniversityPress

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

GRAPHICS FOR ENGINEERS

Course Code: GR22A1011   **L/T/P/C: 1/0/4/3**
I Year II Semester

Course Outcomes
1. Interpret industrial drawings and read working drawings.
2. Draw engineering objects like springs using AutoCAD.
3. Imagine and create multi-views of 2-d plane figures.
4. Construct and interpret multi-views of 3-d solid objects with proper dimensioning,scaling etc.
5. Draw and create pictorial views and model the industrial objects like gears andbearings with solid modelling commands available in AutoCAD tool.

UNIT I
Engineering Graphics with CAD– Introduction engineering graphics and significance of computer aided design CAD software, advanced commands, dimensioning and tolerancing, fundamentals of 2-D construction.

UNIT II
Orthographic projection – Introduction, definition, and classification of projections; pictorial and multi-view, significance of first and third angle methods of projections; **Projections of points** (in all quadrants) and **straight lines** (inclined to one reference plane only).

UNIT III
Projections of planes - definition and types of plane figures (triangle, square, pentagon, hexagon, and circle); projections of plane (inclined to one reference plane only).

UNIT IV
Projections of solids - definition and types of solid objects (prism, cylinder, pyramid, and cone); projections of solid (axis inclined to one reference plane only); creation of threads, washers, keys, and springs.

UNIT V
Isometric views – construction of isomeric views of planes (polygons) and solids (prism, cylinder, pyramid, and cone); fundamentals of 3-d drawings, world coordinate system, solid modelling and commands, creation of gears and bearings; conversion of 3-d to 2-d views and construction of 3-d view from 2-d views (simple objects)

Text Books:
1. Engineering Graphics and Design by Kaushik Kumar / Apurbakumar Roy / Chikesh
2. Engineering Drawing by N.D.BHATT/CHAROTAR PUBLISHING HOUSE PVT LTD

Reference Books:
1. Engineering Graphics Essentials with AutoCAD2018 Instruction by Kirstie Platenberg/SDC publications.
2. Engineering Drawing by Basanth Agrawal/ C M Agrawal/ McGraw Hill Education
3. Engineering Drawing by K.Venu Gopal/New Age Publications.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

APPLIED PHYSICS LAB

Course Code: GR22A1013   **L/T/P/C: 0/0/3/1.5**
I Year II Semesters

Course Outcomes:
1. Compare the behavior of p-n junction diode, Solar cells and LED.
2. Analyze the behavior of magnetic and electric fields with the help of graphs.
3. Infer the work function of a material through photoelectric effect.
4. Discuss the characteristics of Lasers and infer the losses in optical fibers.
5. Estimate the time constant of RC circuit and resonance phenomenon in LCR circuit.

List of Experiments:

1. Energy gap of P-N junction diode: To determine the energy gap of a semiconductordiode.

2. Solar Cell: To study the V-I Characteristics of solar cell.

3. Light emitting diode: To study V-I characteristics of light emitting diode.

4. Stewart – Gee's experiment: Determination of magnetic field along the axis of a currentcarrying coil.

5. Hall effect: To determine Hall co-efficient of a given semiconductor.

6. Photoelectric effect: To determine work function of a given material and Planck'sconstant.

7. LASER: To study the V-I characteristics of LASER sources.

8. Optical fiber: To determine the bending losses of Optical fibers.

9. R-C Circuit: To determine the time constant of R-C circuit.

10. LCR Circuit: To determine the resonant frequency and Quality factor of LCR Circuit inseries and parallel.

Note: Any 8 experiments are to be performed.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DATA STRUCTURES LAB

Course Code: GR22A1020   **L/T/P/C:0/0/2/1**
I Year II Semester

Course Outcomes:

1. Construct executable C programs for sorting techniques.
2. Implement stack and queue data structures and their applications.
3. Interpret various linked list operations to produce executable codes.
4. Develop working procedure for operations on BST using DMA.
5. Demonstrate graph representations and graph traversal techniques

TASK 1
a. Implement Bubble sort using a C program.
b. Implement Selection sort using a C program.
c. Implement Insertion Sort using a C program.

TASK 2
a. Develop a C program for Quick sort.
b. Demonstrate Merge sort using a C program.
c. Design a C program for Radix Sort.

TASK 3
a. Write a C program to implement Stack operations using arrays.
b. Write a C program to implement Queue operations using arrays.
c. Write a C program to implement Circular Queue operations using arrays

TASK 4
a. Write a c program to convert Infix expression to postfix expression.
b. Write a c program to evaluate a Postfix expression.

TASK 5
a. Write a C program to check for balanced parenthesis.
b. Implement a C program for Stack using Linked list.
c. Implement a C program for Queue using Linked list.

TASK 6
a. Implement the following operations on Single Linked List using a C program.
   i. create
   ii. insert
   iii. delete
   iv. search
   v. display

TASK 7
a. Write a C program to implement Circular Linked List operations – create, insert, deleteand display.

TASK 8

a. Write a C program to implement Double Linked List operations – create, insert, delete and display.

TASK 9

a. Implement the following operations on Binary Search Tree
   i. Create
   ii. insert
   iii. search
   iv. delete
   v. count-nodes
   vi. Height.
   vii. Minimum node.
   viii. Maximum node.

TASK 10

a. Develop a C code for Preorder, Inorder and Postorder traversals of a Binary SearchTree using recursion.
b. Design a C program for Level order traversal of a Binary Search Tree.

TASK 11

a. Write a C program to implement Adjacency Matrix of a given Graph
b. Write a C program to implement Adjacency List of a given Graph

TASK 12

a. Implement a C program for DFS traversal on graph.
b. Implement a C program for BFS traversal on graph.

Teaching methodologies:
- Power Point Presentations
- Tutorial Sheets
- Assignments

Text Books:
1. Data Structures, 2/e, Richard F, Gilberg, Forouzan, Cengage
2. Data Structures and Algorithms, 2008,G.A.V.Pai, TMH

References:
1. Data Structure with C, Seymour Lipschutz, TMH
2. Classic Data Structures, 2/e, Debasis, Samanta, PHI,2009
3. Fundamentals of Data Structure in C, 2/e, Horowitz, Sahni, Anderson Freed, UniversityPress

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

Course Code: GR22A1016   **L/T/P/C : 0/0/2/1**
I Year II Semester

Course Outcomes:
1. Interpret the role and importance of various forms of communication skills.
2. Demonstrate the skills needed to participate in a conversation that builds knowledgecollaboratively by listening carefully and respect others point of view.
3. Utilize various media of verbal and non-verbal communication with reference to variousprofessional contexts.
4. Recognize the need to work in teams with appropriate ethical, social and professional responsibilities.
5. speak and pronounce English intelligibly

English Language and Communication Skills Lab (ELCS) shall have two parts:
a. Computer Assisted Language Learning (CALL) Lab
b. Interactive Communication Skills (ICS) Lab

Exercise I CALL Lab:
Understand: Introduction to Phonetics – Speech Sounds – Consonant and Vowel Sounds.
Practice: Introduction to Phonetics – Speech Sounds – Vowels and Consonants.
ICS Lab:
Understand: Ice Breaking and JAM.
Practice: Ice-Breaking Activity and JAM Session. Introducing oneself and others

Exercise II CALL Lab:
Understand: Structure of Syllables – Word Stress and Rhythm– Weak Forms and StrongForms in Context.
Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms inContext.
ICS Lab:
Understand: Features of Good Conversation – Non-verbal Communication.
Practice: Situational Dialogues – Role-Play- Expressions in Various Situations –Making Requests and Seeking Permissions- Telephone Etiquette

Exercise III
CALL Lab: Errors in Pronunciation-the Influence of Mother Tongue (MTI).
Understand: Intonation--Errors in Pronunciation-the Influence of Mother Tongue (MTI). **Practice**: Common Indian Variants in Pronunciation – Differences in British and AmericanPronunciation.
ICS Lab:
Understand: Debates- argumentative vs persuasive - Public Speaking – Exposure to StructuredTalks.
Practice: Debates- Making a Short Speech – Extempore.

Exercise IVCALL Lab:
Understand: Presentation Skills – Elements of Presentation – Organizing Content – Use ofPower Point – Slides Preparation
Practice: Presentation Skills
ICS Lab:
Understand: How to make informal and Formal Presentations

Practice: Collages / Poster Presentations-Power point presentations

Exercise V CALL Lab:
Understand: Listening Skills and its importance-– Purpose- Process- Types- Barriers ofListening -
Listening for General/Specific Details.
Practice: Listening Comprehension Tests.
ICS Lab:
Understand: Mind map - Story Telling - Narrating a story using mind maps
Practice: Weaving Stories

Minimum Requirement of infrastructural facilities for ELCS Lab:
1.Computer Assisted Language Learning (CALL) Lab
2.Interactive Communication Skills (ICS) Lab

II YEAR
I SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DIGITAL LOGIC DESIGN

Course Code: GR22A2067   **L/T/P/C: 3/0/0/3**
II Year I Semester

Course Outcomes:
1. Apply knowledge of fundamental Boolean principles and manipulation to design LogicCircuits.
2. Apply various techniques of Boolean function simplification to create minimalexpressions.
3. Create combinational circuits for a specified behavior with minimal specification.
4. Synthesize Sequential circuits with minimal states.
5. Realize combinational circuitry using Combinational PLDs and develop & test HDLmodels of Logic Circuits.

UNIT I
Binary Systems: Digital Systems, Binary Numbers, Number Base Conversions, Octal and Hexadecimal Numbers, Complements, Signed Binary Numbers, Binary Codes, Binary Storage and Registers, Binary Logic.
Boolean Algebra And Logic Gates: Basic Definitions, Axiomatic definition of Boolean Algebra, Basic theorems and properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates, Integrated Circuits.

UNIT II
Gate-Level Minimization: The Map method, Four-variable map, Five-variable map, Productof Sum's simplifications, Don't care conditions, NAND and NOR implementation, other two level implementations, Exclusive-OR Function.

UNIT III
Combinational Logic: Combinational Circuits, Analysis Procedure, Design Procedure, Binary Adder Subtractor, Decimal Adder, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers.

UNIT IV
Synchronous Sequential Logic: Sequential Circuits, Latches, Flip-Flops, Analysis of clocked sequential circuits, State Reduction and Assignment, Design Procedure.
Registers and Counters: Registers, Shift registers, Ripple Counters, Synchronous Counters, other counters.

UNIT V
Memory and Programmable Logic: Introduction, Random Access Memory, Memory decoding, Error detection and correction, Read only Memory, Programmable Logic Array, Programmable Array Logic, Sequential Programmable Devices.
Hardware Description Language: Hardware Description Language, Definition, Structural Definition of HDL, HDL models for Combinational circuits, HDL for models for Sequential circuits.

Teaching Methodologies:
• Power Point Presentations
• Tutorial Sheets
• Assignments

Text Books:
1. Digital Design with an Introduction to the Verilog HDL – Fifth Edition, M. MorrisMano, Pearson Education.
2. Fundamentals of Logic Design – Roth, 7th Edition, Thomson.

References:
1. Switching and Finite Automata Theory by ZviKohavi, Tata Mc Graw Hill.
2. Switching and Logic Design – CVS Rao, Pearson Education
3. Digital Principles and Design – Donald D.Givone, Tata Mc Graw Hill.
4. Fundamentals of Digital Logic and Micro Computer Design, 5th Edition, M.Rafiquzzaman (John Willey)

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

JAVA PROGRAMMING

Course Code: GR22A2068   **L/T/P/C: 3/0/0/3**
II Year I Semester

Course Outcomes:
1. Identify the model of Object-Oriented Programming: Abstract data types, Encapsulation, Inheritance and Polymorphism.
2. Summarize the fundamental features like Interfaces, Exceptions and Collections.
3. Correlate the advantages of Multi-threading.
4. Design interactive programs using Applets, AWT and Swings.
5. Develop real time applications using the features of Java.

UNIT I
Object Oriented Thinking: Introduction, Need of object-oriented programming, principles of object-oriented languages, Applications of OOP, history of JAVA, Java Virtual Machine, Java features, Program structures, Installation of JDK.
Variables, Primitive data types, Identifiers- Naming Conventions, Keywords, Literals, Operators- Binary, Unary and Ternary, Expressions, Primitive Type conversion and casting, flow of control- branching, conditional, loops.

UNIT II
CLASSES, INHERITANCE, POLYMORPHISM:
Classes and Objects: Classes, Objects, creating objects, methods, constructors- constructor overloading, cleaning up unused objects- Garbage collector, class variable and methods- static keyword, this keyword, arrays, Command linearguments, Nested Classes
Strings: String, StringBuffer, StringTokenizer
Inheritance and Polymorphism: Types of Inheritance, deriving classes using extends keyword, super keyword, Polymorphism – Method Overloading, Method Overriding, final keyword, abstract classes.

UNIT III
INTERFACES, PACKAGES, EXCEPTIONS
Interfaces: Interface, Extending interface, interface Vs Abstract classes.
Packages: Creating Packages, using Packages, Access protection, java I/O package. Exceptions
- Introduction, **Exception handling Techniques:** try…catch, throw, throws, finally block, userdefined Exception.

UNIT IV
MULTITHREADING, COLLECTIONS
java.lang.Thread, the main Thread, creation of new Threads, Thread priority, multithreading- using isalive() and join(), Synchronization, suspending and resuming Threads, Communication between Threads.Exploring java.io, Exploring java.util

Collections: Overview of Collection Framework : ArrayList, LinkedList, Vector, HastSet,TreeSet, HashMap, HashTable, TreeMap, Iterator, Comparator

UNIT V
APPLETS, AWT AND SWINGS
Applet class, Applet structure, an example Applet program, Applet life cycle.
Abstract Window Toolkit: Why AWT?java.awt package, components and containers, Button,Label, Checkbox, Radio buttons, List boxes, choice boxes, Text field and Text area, container classes, Layout Managers.
Event Handling: Introduction, Event Delegation Model, Java.awt.event Description, Adapterclasses, Innerclasses.
Swing: Introduction, JFrame, JApplet, JPanel, Components in swings, JList and JScroll Pane,Split Pane, JTabbed Pane, Dialog Box, Pluggable Look andfeel.

Teaching Methodologies:

- Power Point Presentations
- Tutorial Sheets
- Assignments

Text Books/ References:
1. Java: The Complete Reference, 10thedition, Herbert Schildt, McgrawHill.
2. Java Fundamentals: A Comprehensive Introduction, Herbert Schildt and Dale Skrien,TMH.
3. Java for Programming, P.J.DietelPearsonEducation
4. Object Oriented Programming through Java, P.Radha Krishna, UniversitiesPress.
5. Thinking in Java, Bruce Eckel, PearsonEducation
6. Programming in Java, S.Malhotra and S.Choudhary, Oxford University Press

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DESIGN AND ANALYSIS OF ALGORITHMS

Course Code : GR22A2077   **L/T/P/C: 3/0/0/3**

II Year I Semester

Course Outcomes:
1. Distinguish various performances of algorithms.
2. Illustrating Divide and Conquer Design Paradigm algorithms.
3. Examining various algorithms based on Dynamic programming paradigm.
4. Discriminate greedy approach and back tracking algorithms.
5. Demonstrate branch and bound problems and Distinguish problems related to various complexity classes.

UNIT I
Introduction to Algorithms: Definition of an algorithm, properties of an Algorithm, performance analysis--space complexity & time complexity, amortized analysis

UNIT II
Disjoint sets: Disjoint set Representation, Operations, union and find algorithms.
Divide and Conquer: General method, applications, binary search, Quick sort, merge sort, Strassen's matrix multiplication.

UNIT III
Dynamic Programming: General method, applications, optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, travelling salesperson problem, optimal rod-cutting-Top down approach and bottom up approach.

UNIT IV
Greedy Method: General method, applications-- job sequencing with deadlines, 0/1 knapsack problem, minimum cost spanning trees, single source shortest path problem, activity selection problem.
Backtracking: General method, applications, n-queen problem, sum of subsets problem, Hamiltonian cycles.

UNIT V
Branch and Bound: General method, applications, travelling sales person problem, 0/1 knapsack problem: LC branch and bound solution, FIFO branch and bound solution
Complexity Classes: Non deterministic algorithms, deterministic algorithms, relationship between P and NP, NP-completeness, circuit-satisfiability problem, 3-CNF satisfiability.

Text Books/ References:
1. Ellis Horowitz, SatrajSahni and S Rajasekharam, Fundamentals of Computer Algorithms, Galgotia publishers 2. T H Cormen, C E Leiserson, and R L Rivest, Introduction to Algorithms, 3rdEdn, Pearson Education
2. Cormen, Thomash H., Leiserson, Charles E., Rivest, Ronald L., & Stein, Clifford. Introduction to Algorithms. 3rd Edition. 2010.
3. Goodrich, Michael T. & Roberto Tamassia, Algorithm Design, Wiley Singapore Edition, 2002.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DISCRETE MATHEMATICS

Course Code: GR22A2075   **L/T/P/C: 2/1/0/3**
II Year I Semester

Course Outcomes:
1. Use propositional and predicate logic in knowledge representation and truthverification.
2. Demonstrate the application of discrete structures in different fields of computerscience.
3. Apply basic and advanced principles of counting to the real-world problems.
4. Able to formulate the problem and solve using recurrence relations and generatingfunctions.
5. Devise the given problem as a graph network and solve with techniques of graphtheory.

UNIT I
Mathematical Logic: Statements and notations, Connectives, Well-formed formulas, Truthtables, Tautology, Equivalence implication, Normal forms.
Predicates: Predicative logic, Free & Bound variables, Rules of inference, Consistency,proof of contradiction.

UNIT II
Set Theory: Properties of binary relations, Compatibility, Equivalence and Partial orderingrelations, Hasse diagram, Lattice and its properties.
Functions: Inverse function,Composite of functions, Recursive functions, Pigeon holeprinciple and its application.
Algebraic Structures: Algebraic systems examples and general properties, Semi groups andmonads, groups and sub groups' Homomorphism, Isomorphism.

UNIT III
Elementary Combinatorics: Basics of counting, Combinations & Permutations, with repetitions, Constrained repetitions, Binomial coefficients, Binomial and Multinomial theorems, the principle of Inclusion – Exclusion.

UNIT IV
Recurrence Relation: Generating functions, Function of sequences calculating coefficient of generating function, Recurrence relations, solving recurrence relation by substitution, Generating functions and Characteristics roots, solution of Inhomogeneous recurrence relation.

UNIT V
Graph Theory: Representation of graph, Graph theory and applications, Planar graphs, basic concepts of Isomorphism and Sub graphs, Multi graphs and Euler circuits, Hamiltonian graphs, Chromatic numbers, Depth First Search, Breadth First Search, Spanning trees.

Teaching Methodologies:

- Power Point Presentations
- Tutorial Sheets
- Assignments

Text Books/ References:

1. Discrete and Combinational Mathematics- An Applied Introduction-5th Edition–Ralph.P.Grimadi .Pearson Education
2. Discrete Mathematical Structures with applications to computer science Trembly J.P. & Manohar.P,TMH
3. Mathematical Foundations for Computer Science Engineers, Jayant Ganguly,Pearson Education
4. Discrete Mathematics and its Applications, Kenneth H. Rosen, Fifth Edition.TMH.
5. Discrete Mathematics with Applications, Thomas Koshy, Elsevier
6. Discrete Mathematical Structures, Bernand Kolman, Roberty C. Busby, SharnCutter Ross, Pearson
7. Discrete mathematical structures, Dr. D S Chandrashekar, PRISM Publishers.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DATABASE MANAGEMENT SYSTEMS

Course Code: GR22A2069   **L/T/P/C: 3/0/0/3**
II Year I Semester

Course Outcomes:
1. Identify the role of Database System Applications and the design issues related.
2. Design the logical model for the applications and apply indexing techniques.
3. Construct a Database Schema, manipulate data using a SQL.
4. Apply the Schema Refinement techniques for a database design for optimized access.
5. For a given transaction-processing system, determine the transaction atomicity,consistency, isolation, and durability.

UNIT I
Introduction to Database And System Architecture: Database Systems and their Applications, Database Vs File System, View of Data, Data Models, Database Languages- DDL and DML, Transaction Management, Database users and Administrators, Database System Structure.
Introduction to Database Design: ER Diagrams, Entities, Attributes and Entity sets, Relationships and Relationship set, Extended ER Features, Conceptual Design with the ER Model, Logical database Design.

UNIT II
SQL Queries and Constraints: SQL Data Definition, Types of SQL Commands,Form of Basic SQL Query, SQL Operators, Set Operators, Nested Queries, Aggregate Operators, NULL values, Integrity Constraints Over Relations, Joins, Introduction to Views, Destroying / AlteringTables and Views, Cursors, Triggers and Active Databases.

UNIT III
Relational Model: Introduction to Relational Model, Basic Structure, Database Schema, Keys, Relational Algebra and Relational Calculus.
Storage and Indexing: File Organizations and Indexing-Overview of Indexes, Types of Indexes, Index Data Structures, Tree structured Indexing, Hash based Indexing.

UNIT IV
Schema Refinement and Normal Forms: Introduction to Schema Refinement, Functional Dependencies, Reasoning about FD, Normal Forms, Properties of Decomposition.

UNIT V
Transaction Management: Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability.
Concurrency Control: Lock based Protocols, Timestamp based protocols,
Recovery System: Recovery and Atomicity, Log based recovery, Shadow Paging, Recoverywith concurrent Transactions, Buffer Management.

Teaching Methodologies:
• Power Point Presentations
• Tutorial Sheets
• Assignments

Textbooks/ References:

1. "Data base Management Systems", Raghurama Krishnan, Johannes Gehrke,TATAMcGraw Hill 3rdEdition
2. "Data base System Concepts", Silberschatz, Korth, McGraw hill, V Edition.
3. "Introduction to Database Systems", C.J.DatePearsonEducation.
4. "Database Systems design, Implementation, and Management", Rob & Coronel5thEdition.
5. "Database Management Systems", P. Radha Krishna HI-TECH Publications 2005.
6. "Database Management System", ElmasriNavate, PearsonEducation.
7. "Database Management System", Mathew Leon,Leo

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

SCRIPTING LANGUAGES LAB

Course Code: GR22A2085   **L/T/P/C: 0/0/3/1.5**
II Year I Semester

Course Outcomes:
1. Design JavaScript and python applications for day to day activities.
2. Implement web application using PHP.
3. Design, debug and run complete web applications using PHP and MYSQL.
4. Build web applications using JavaScript and AJAX programming.
5. Develop web application to retrieve data from database using AJAX.

TASK 1
a. Write a JavaScript code to edit a paragraph text on a button click.
b. Insert an image in HTML page using image tag. Define a JavaScript code to change image ona button click.

TASK 2
a. Write a JavaScript Code to check whether given number is positive, negative or zero
b. Write a JavaScript Code to check whether given number is palindrome or not

TASK 3
Design a simple multiplication table using JavaScript asking the user the number of rows and columns as user wants to print.

TASK 4
Create a sample form program that collects the first name, last name, user id, and password and confirms password from the user. All the inputs are mandatory. Also, the values entered in the password and confirm password textboxes should be the same. After validating using JavaScript, Report error messages in red color just next to the textbox where there is an error.

TASK 5
a. Write a Python Code to find GCD of given numbers
b. Write a Python Code to check whether given number is prime or not
c. Write a Python Code to generate Fibonacci series upto limit 'n'

TASK 6
a. Write a Python Code to count the number of odd and even numbers in a given list ofnumbers
b. Write a Python Code to find the largest number in the given list
c. Write a Python Code to reverse a given list

TASK 7
a. Write a Python program that will prompt the user for a file name, read all the lines fromthe file into a list, sort the list, and then print the lines in sorted order.
b. Write a Python program that asks the user for a filename, and then prints the number ofcharacters, words, and lines in the file.

TASK 8

Implement PHP script for the following.

a. Find the factorial of a number (while loop)
b. To reverse the digit (Use do while)
c. Find the sum of the digits (Use for loop)
d. Write a PHP script for the following: Design a form to accept the details of 5different items, such as item code, item name, units sold, and rate. Display the bill in the tabular format. Use only 4 text boxes. (Hint: Use of explode function.)

TASK 9

a. Assume an array with different values. Write a PHP script to print only unique values fromthe array.
b. Write a PHP script for finding sum of array elements
c. Write a PHP script for searching an element in an array using linear search

TASK 10

a. Examine and write a PHP script for creating required student information in the database.
b. Write a PHP script for deleting and updating a specified student from the database.

TASK 11

Create a simple XMLHttpRequest and retrieve data from a text file.

TASK 12

Develop a AJAX application to retrieve the contents of database.
Example: Consider a webpage with a dropdown list of set of names, as user selects a name the application should be able to display selected user information (username, Phone number, Email-id, Place) in a table. When user selects other name, other user information should be displayed without reloading the page.

Text Books/ References:

1. Introduction to Programming using Python, Y.Daniel Liang, Pearson.
2. Beginning PHP and MySQL 3rd Edition W. Jason Gilmoren - Third Edition, Apresspublications
3. Beginning JavaScript with DOM scripting and AJAX: From Novice to Professional byChristian Heilman

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
JAVA PROGRAMMING LAB

Course Code: GR22A2071   **L/T/P/C: 0/0/4/2**
II Year I Semester

Course Outcomes:
1. Analyze a problem, identify and define the computing requirements appropriate to itssolution using object-oriented programming concepts.
2. Design the applications using Inheritance, Polymorphism and Synchronization concepts.
3. Handle exceptions at Compile time and Run time.
4. Solve the real-world problems using Java Collection framework.
5. Develop GUI applications using Applets, AWT and Swings.

TASK 1
Write java programs that implement the following
a. Constructor
b. Parameterized constructor
c. Method overloading
d. Constructor overloading.

TASK 2
a. Write a Java program that checks whether a given string is a palindrome or not. Ex:MADAM is a palindrome.
b. Write a Java program for sorting a given list of names in ascending order.
c. Write a Java Program that reads a line of integers, and then displays each integer and thesum of all the integers (Use String Tokenizer class of java.util)

TASK 3
Write java programs that uses the following keywords
   a) This b)super   c)static   d)final

TASK 4
a. Write a java program to implement method overriding
b. Write a java program to implement dynamic method dispatch.
c. Write a Java program to implement multiple inheritance.
d. Write a java program that uses access specifiers.

TASK 5
a. Write a Java program that reads a file name from the user, then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.
b. Write a Java program that reads a file and displays the file on the screen, with a line numberbefore each line.
c. Write a Java program that displays the number of characters, lines and words in a text file

TASK 6

a. Write a Java program for handling Checked Exceptions.

b. Write a Java program for handling Unchecked Exceptions.

TASK 7

a. Write a Java program that creates three threads. First thread displays "Good Morning" every one second, the second thread displays "Hello" every two seconds and the third thread displays "Welcome" every three seconds.

b. Write a Java program that correctly implements producer consumer problem using the concept of inter thread communication.

TASK 8

Write a program illustrating following collections framework

a) ArrayList   b) Vector   c) HashTable   d) Stack

TASK 9

a. Develop an applet that displays a simple message.

b. Develop an applet that receives an integer in one text field and compute its factorial valueand return it in another text field, when the button named "Compute" is clicked.

c. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttonfor the digits and for the +, -,*, % operations. Add a text field to display the result.

TASK 10

a. Write a Java program for handling mouse events.

b. Write a Java program for handling key events.

TASK 11

a. Write a program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields Num1 and Num 2.

b. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1or Num2 were not an integer, the program would throw Number Format Exception. If Num2 were Zero, the program would throw an Arithmetic Exception and display the exception in a message dialog box.

TASK 12

a. Write a java program that simulates traffic light. The program lets the user select one of three lights: red, yellow or green. When a radio button is selected, the light is turned on, andonly one light can be on at a time. No light is on when the program starts.

b. Write a Java program that allows the user to draw lines, rectangles and ovals.

TASK 13

Create a table in Table.txt file such that the first line in the file is the header, and the remaining lines correspond to rows in the table. The elements are separated by commas. Write a java program to display the table using JTable component.

Text Books/ References:
1. Java: The Complete Reference, 10thedition, Herbert Schildt, McgrawHill.
2. Java Fundamentals- A Comprehensive introduction, Herbert schildtand Dale skrien,TMH.
3. Java for programming, P.J.Dietel Pearson education (OR) Java: How to ProgramP.J.Dietel and H.M.Dietel,PHI
4. Object Oriented Programming through java, P.Radha Krishna, UniversitiesPress.
5. Thinking in Java, Bruce Eckel, PearsonEducation
6. Programming in Java, S.Malhotra and S.Choudhary, Oxford University Press.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DATABASE MANAGEMENT SYSTEMS LAB

Course Code: GR22A2072   **L/T/P/C: 0/0/3/1.5**

II Year I Semester

Course Outcomes:

1. Construct the schema of the database and modify it.
2. Compile a query to obtain the aggregated result from the database.
3. Speculate the concepts of various database objects.
4. Compare the use of procedure and function in database.
5. Use triggers and packages to create applications in the database.

Task-1:

DDL commands (Create, Alter, Drop, Truncate)

1. Create a table EMP with the following structure.

   Name   Type

   EMPNO   NUMBER(6)

   ENAME   VARCHAR2(20)

   JOB   VARCHAR2(10)

   MGR   NUMBER(4)

   DEPTNO   NUMBER(3)

   SAL   NUMBER(7,2)

2. Add a column commission to the emp table. Commission should be numeric with null values allowed.
3. Modify the column width of the job field of emp table.
4. Create dept table with the following structure.

   Name   Type

   DEPTNO   NUMBER(2)

   DNAME   VARCHAR2(10)

   LOC   VARCHAR2(10)

   DEPTNO as the primary key

5. Add constraints to the emptable that is empno as the primary key and deptno as the foreignkey.

6. Add constraints to the emptable to check the empno value while entering(i.e)empno>100.Salaryvalue by default is 5000, otherwise it should accept the values from the user.

7. Add columns DOB to the emp table. Add and drop a column DOJ to the emp table.

Task-2: DML COMMANDS (Insert, Update, Delete)

1. Insert 5 records into dept Insert few rows and truncate those from the emp1 table andalso drop it.
2. Insert 11 records into emp table.
3. Update the emp table to set the value of commission of all employees to Rs1000/- whoare working as managers.
4. Delete only those who are working as supervisors.
5. Delete the rows whose empnois7599.

Task-3: TCL COMMANDS (Save Point, Rollback Commit)

Task-4: DQL COMMAND (Select)- SQL Operators and Order by Clause

1. List the records in the emp table order by salary in descending order.
2. Display only those employees whose deptnois30.
3. Display deptno from the table employee avoiding the duplicated values.
4. List all employee names, salary and 15% rise in salary. Label the column as pay hike.
5. Display the rows whose salary ranges from 15000 to30000.
6. Display all the employees in dept 10 and 20 in alphabetical order of names.
7. List the employee names who do not earn commission.
8. Display all the details of the records with 5-character names with 'S' as starting character.
9. Display joining date of all employees in the year of1998.
10. List out the employee names whose salary is greater than 5000 and less than6000

Task-5: SQL Aggregate Functions, Group By clause, Having clause

1. Count the total records in the emp table.
2. Calculate the total and average salary of the employee.
3. Determine the max and min salary and rename the column as max-salary and min_salary.
4. Find number of departments in employee table.
5. Display job wise sum, average, max, min salaries.
6. Display maximum salaries of all the departments having maximum salary >2000
7. Display job wise sum, avg, max, min salaries in department 10 having average salary is greater than 1000 and the result is ordered by sum of salary in descending order.

Task-6: SQL Functions

1. Display the employee name concatenate with employee number.
2. Display half of employee name in upper case and half in lowercase.
3. Display the month name of date "14-jul-09" in full.
4. Display the Date of joining of all employees in the format "dd-mm-yy".
5. Display the date two months after the Date of joining of employees.
6. Display the last date of that month in"05-Oct-09".
7. Display the rounded date in the year format, month format, day format in the employee
8. Display the commissions earned by employees. If they do not earn commission, display it as "No Commission".

Task-7: Nested Queries

1. Find the third highest salary of an employee.
2. Display all employee names and salary whose salary is greater than minimum salary of the company and job title starts with 'M'.
3. Write a query to display information about employees who earn more than any employee indept30.
4. Display the employees who have the same job as Jones and whose salary is greater than or equalto the salary of Ford.
5. List out the employee names who get the salary greater than the maximum salaries of dept withdeptno 20,30.
6. Display the maximum salaries of the departments whose maximum salary is greater than 9000.
7. Create a table employee with the same structure as the table emp and insert rows into the table using select clauses.
8. Create a manager table from the emp table which should hold details only about the managers.

Task-8 Joins, Set Operators.

1. Display all the employees and the departments implementing a left outer join.
2. Display the employee name and department name in which they are working implementing a full outer join.
3. Write a query to display their employee names and their managers' name and salary for every employee.
4. Write a query to output the name, job, empno, deptname and location for each dept, even if there are no employees.
5. Display the details of those who draw the same salary.

Task-9: Views

1. Create a view that displays the employee id, name and salary of employees who belong to 10thdepartment.
2. Create a view with read only option that displays the employee name and their department name.
3. Display all the views generated.
4. Execute the DML commands on views created and drop them
5. Practices on DCL commands.

Task-10:

1. Sequence and Indexes and Table locking
2. Write a PL/SQL code to retrieve the employee name, join date and designation of an employeewhose number is given as input by the user.
3. Write a PL/SQL code to calculate tax of employee.
4. Write a PL/SQL program to display top ten employee details based on salary using cursors.
5. Write a PL/SQL program to update the commission values for all the employees' with salary lessthan 2000, by adding 1000 to the existing values.

Task-11:

1. Write a trigger on employee table that shows the old and new values of employee name afterupdating on employee name.
2. Write a PL/SQL procedure for inserting, deleting and updating the employee table.
3. Write a PL/SQL function that accepts the department number and returns the total salary of that department.

Task-12:

1. Write PL/SQL program to handle predefined exceptions.
2. Write PL/SQL program to handle user defined exception.
3. Write a PL/SQL code to create
    a. Package specification
    b. Package body to insert, update, delete and retrieve data on emp table

Text/Reference Books

1. The Complete Reference,3rd edition by James R.Groff, Paul N.Weinberg, AndrewJ. Oppel
2. SQL & PL/SQL for Oracle10g, Black Book,Dr.P.S.Deshpande.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
VALUE ETHICS AND GENDER CULTURE

Course Code: GR22A2002   **L/T/P/C: 2/0/0/0**
II Year I Semester

Course Outcomes
1. To enable the student to understand the core values that shapes the ethical behaviour. And Student will be able to realize the significance of ethical human conduct and self- development
2. Students will be able to inculcate positive thinking, dignity of labour and religious tolerance.
3. The students will learn the rights and responsibilities as an employee and a teammember.
4. Students will attain a finger grasp of how gender discrimination works in our society and how to counter it.
5. Students will develop a better understanding on issues related to gender and Empowering students to understand and respond to gender violence.

UNIT I
Values and Self-Development–social values and individual attitudes, Importance of cultivationof values, Sense of duty, Devotion, Self-reliance, Confidence, Concentration, Truthfulness, Cleanliness, Honesty, Humanity, Power of faith, National unity, Patriotism, Love for nature, Discipline.

❖ A Case study on values and self-development

UNIT II
Personality and Behaviour Development-positive thinking, punctuality, avoiding fault finding, Free from anger, Dignity of labour, religious tolerance, Aware of self-destructive habits.

❖ A Case study on Personality

UNIT III
Introduction to Professional Ethics: Basic Concepts, Governing Ethics, Personal & Professional Ethics, Ethical Dilemmas, Life Skills, Emotional Intelligence, Thoughts of Ethics, Value Education, Dimensions of Ethics, Profession and professionalism, Professional Associations, Professional Risks, Professional Accountabilities, Professional Success, Ethics and Profession.

❖ A Case study on professional ethics

UNIT IV
Introduction to Gender - Definition of Gender, Basic Gender Concepts and Terminology, Attitudes towards Gender, Social Construction of Gender.

❖ A Case study/ video discussion on attitudes towards gender

UNIT V
Gender-based Violence -The concept of violence, Types of Gender-based violence, the relationship between gender, development and violence, Gender-based violence from a human rights perspective.

❖ A Case study/ video discussion on gender-based violence in view of human rights

Textbooks
1. Professional Ethics: R. Subramanian, Oxford University Press, 2015.
2. Ethics in Engineering Practice & Research, Caroline Whit beck, 2e, Cambridge University Press 2015.

3. A Bilingual Textbook on Gender" written by A. Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, GoguShyamala, Deepa Sreenivas and Susie Tharu and published by Telugu Akademi, Hyderabad,Telangana State in the year 2015.

Reference Books

1. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012
2. Abdulali Sohaila. "I Fought For My Life…and Won."Available onlineat: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/
3. Engineering Ethics, Concepts Cases: Charles E Harris Jr., Michael S Pritchard, MichaelJ Rabins, 4e , Cengage learning, 2015.
4. Business Ethics concepts & Cases: Manuel G Velasquez, 6e, PHI, 2008

II YEAR
II SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
COMPUTER ORANIZATION

Course Code: GR22A2073   **L/T/P/C: 3/0/0/3**
II Year II Semester

Course Outcomes:
1. Demonstrate knowledge of register organization of a basic computer system
2. Incorporate In-depth understanding of control unit organization and micro programmedcontrol.
3. Understand the performance of central processing unit of a basic computer system.
4. Apply various algorithms to perform arithmetic operations and propose suitable hardware and appraise various methods of communications with I/O devices.
5. Analyze and emphasize various communication media in the basic computer systemusing design of various memory structures and Multiprocessor systems.

UNIT I
Basic Structure of Computers: Computer Types, Functional unit, Data Representation, Fixed Point Representation, Floating – Point Representation, Error Detection codes.
Register Transfer Language and Micro operations: Register Transfer language. Register Transfer, Bus and memory transfers, Micro Operations and its types, Arithmetic logic shift unit.

UNIT II
Basic Computer Organization and Design: Instruction codes, Computer Registers, Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt, Complete Computer Description.
Micro Programmed Control: Control memory, Address sequencing, Micro program example,Design of control unit, Micro program Sequencer, Hard wired control Vs Micro programmed control.

UNIT III
Central Processing Unit Organization: General Register Organization, STACK organization. Instruction formats, Addressing modes. DATA Transfer and manipulation, Program control. Reduced Instruction set computer.
Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Floating – point Arithmetic operations, BCD Adder.

UNIT IV
Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous data transfer Modes of Transfer, Priority Interrupt, Direct memory Access, Input –Output Processor (IOP).
Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, Dependencies, Vector Processing.

UNIT V
Memory Organization: Memory Hierarchy, Main memory- RAM and ROM chips, Memory Address map, Auxiliary memory – Magnetic Disks, Magnetic Tapes, Associative Memory – Hardware Organization, Match Logic, Cache Memory – Associative mapping, Direct mapping, Set associative mapping, Writing into cache and cache initialization, Cache Coherence, Virtual memory – Address Space and Memory Space, Address mapping using pages, Associative Memory page table, Page Replacement.
Multi Processors: Characteristics or Multiprocessors, Interconnection Structures, Cache Coherence, Shared Memory Multiprocessors.

Teaching Methodologies:
- Power Point Presentations
- Tutorial Sheets
- Assignments

Text Books:
1. Computer Systems Architecture – M.Moris Mano, 3rd Edition, Pearson/PHI
2. Computer Organization – Carl Hamacher, ZvonksVranesic, SafeaZaky, 5th Edition,McGraw Hill.

References:
1. Computer Organization and Architecture – William Stallings 7th Edition, Pearson/PHI
2. Structured Computer Organization – Andrew S. Tanenbaum, 6th Edition PHI/Pearson
3. Fundamentals or Computer Organization and Design, - SivaraamaDandamudi Springer Int.Edition.
4. Computer Architecture a quantitative approach, John L. Hennessy and David A. Patterson,5th Edition Elsevier
5. Computer Architecture: Fundamentals and principles of Computer Design, Joseph D. DumasII, BS Publication.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

OPERATING SYSTEMS

Course Code: GR22A2074   **L/T/P/C: 2/1/0/3**
II Year II Semester

Course Outcomes:
1. Explain different functions and types of operating system and implement variousprocess management concepts for maximization of CPU throughput.
2. Analyse synchronization problems and design a deadlock management scheme.
3. Optimize memory management for improved system performance.
4. Demonstrate disk management, implement disk scheduling and file system interface
5. Describe protection and security policies for OS.

UNIT I
Operating System Overview: Objectives and functions, Computer System Architecture, Evolution of Operating Systems, System Services, System Calls, System Programs, OS Structure, Virtual machines.
Process Management: Process concepts, CPU scheduling-criteria, Algorithms with evaluation, Preemptive / Non-Preemptive Scheduling, Threads, Multithreading Models.

UNIT II
Concurrency: Process synchronization, Critical-section problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classic problems of synchronization, Monitors.
Deadlocks: Principles of deadlock–system model, Deadlock characterization, Deadlock prevention, Detection and Avoidance, Recovery from deadlock.

UNIT III
Memory Management: Swapping, Contiguous memory allocation, Paging, Structure of the page table, Segmentation.
Virtual Memory: Demand paging, Page replacement algorithms, Allocation of Frames, Thrashing.

UNIT IV
Mass-storage Structure: Overview of Mass-storage structure, Disk structure, Disk attachment, Disk scheduling, Swap-space management.
File System Implementation: Access Methods, File system structure, File system implementation, Directory implementation, Allocation methods, Free-space management.

UNIT V
Protection: Goals and Principles of Protection, Implementation of Access Matrix, Accesscontrol, Revocation of Access Rights.
Security: The Security problem, Program threats, System and network threats, Implementingsecurity defenses.

TEXT / REFERENCE BOOKS:
1. Operating System Principles,7th Edition by Avi Silberschatz, Peter Galvin, GregGagne, Wiley Asia Student Edition.
2. Operating Systems: Internals and Design Principles, 5th Edition, William Stallings,Prentice Hall of India.
3. Operating System:A Design-oriented Approach, 1st Edition b y Charles Crowley,Irwin Publishing

4. Operating Systems: A Modern Perspective, 2nd Edition by Gary J. Nutt, Addison-Wesley
5. Modern Operating Systems, Andrew S Tanenbaum 3rd Edition PHI.
6. Operating Systems, R. Elmasri, A. G. Carrick and D. Levine, Mc Graw Hill.
7. Operating Systems in depth, T. W. Doeppner, Wiley.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DATA SCIENCE WITH R PROGRAMMING

Course Code: GR22A2086   **L/T/P/C: 3/0/0/3**
II Year II Semester

Course Outcomes:
1. Use R environment, data structures, functions, to solve statistical problems
2. Analyse basic and descriptive statistical analysis methods using R
3. Apply data collection , preparation, visualization and feature engineering with R
4. Summarize data analysis and machine learning techniques with R
5. Implement R advanced features for real time business case studies

UNIT I
Introduction to R - R Windows Environment, R-Data types,R-Data Structures,R Functions and loops, Reading Datasets, Working with different file types, R packages. Introduction to statistical learning and R-Programming,Overview of CRAN.

UNIT II
Descriptive Statistics- Measures of central tendency, Measures of location of dispersions, Practice and analysis with R.
Basic Statistical Analysis - Statistical hypothesis generation and testing, Chi-Square test, t- Test, Analysis of variance, Correlation analysis, Maximum likelihood test, Practice and analysis with R.

UNIT III
Introduction to Data Science:Data Science Terminology, Data Science Process, DataScience Project Roles.
Data Collection and Management: Introduction, Sources of data, Data collection and APIs,Exploring and fixing data, Data storage and management, Using multiple data sources.
Data Preparation, Feature Engineering, Data Visualization in R.

UNIT IV
Data Analysis techniques - Exploratory data analysis, Association rules analysis,Regression analysis, Classification techniques, Clustering, Practice and analysis with R **Model Evaluation** - Machine Learning concepts, types of machine learning, Machinelearning with R.

UNIT V
Advanced R Programming – Data Models, PCA, LDA, Exploratory fact Analysis, NNModeling with R.
Business Case studies and projects -Understanding business scenarios, scalable andparallel computing with Hadoop and Map-Reduce, Sensitivity Analysis.

Text Books:
1. Probability & Statistics for Engineers & Scientists (9th Edn.), Ronald E. Walpole,Raymond H. Myers, Sharon L. Myers and Keying Ye, Prentice Hall Inc.
2. The Elements of Statistical Learning, Data Mining, Inference, and Prediction(2nd Edn.), Trevor Hastie Robert Tibshirani Jerome Friedman, Springer, 2014
3. An Introduction to Statistical Learning: with Applications in R, G James, D. Witten,T Hastie, and R. Tibshirani, Springer, 2013

4. Software for Data Analysis: Programming with R (Statistics and Computing), John M. Chambers, Springer
5. Beginning R: The Statistical Programming Language, Mark Gardener, Wiley, 2013

Reference Books:
1. Advances in Complex Data Modeling and Computational Methods in Statistics,Anna Maria Paganoni and Piercesare Secchi, Springer, 2013
2. Data Mining and Analysis, Mohammed J. Zaki, Wagner Meira, Cambridge, 2012
3. Hadoop: The Definitive Guide (2nd Edn.) by Tom White, O'Reilly, 2014
4. MapReduce Design Patterns: Building Effective Algorithms and Analytics forHadoop and Other Systems, Donald Miner, Adam Shook, O'Reilly, 2014

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

FULL STACK WEB DEVELOPMENT

Course Code: GR22A2076   **L/T/P/C: 3/0/0/3**
II Year II Semester

Course Outcomes:
1. To develop a complete web application from the scratch that includes Front-end, Back-end and Data-exchange technologies
2. Attain the knowledge of web development basics, HTML, CSS and building interactive web pages using JavaScript & jQuery.
3. Design the applications using XML and AngularJS.
4. Construct the real-world applications using PHP and MySQL
5. Become an industry-ready engineer ready to be deployed in a project

UNIT- I
HTML Common tags- List, Tables, images, forms, Frames; Cascading Style sheets. Introduction to Java Scripts, Objects and Functions in java script, Manipulating DOM,
HTML DOM Events, Learning Ajax
jQuery Programming: Selectors & Mouse Events, Form Events, DOM Manipulation, Effects& Animation, Traversing & Filtering

UNIT- II
XML: Introduction to XML, Defining XML tags, their attributes and values, Document Type Definition, XML Schemes, Document Object Model, XHTML Parsing XML Data – DOM and SAX Parsers.
Angular JS: Introduction, Expressions, Modules, directives, AngularJS HTML DOM, Events, Forms.

UNIT -III
Introduction to Servlets: Common Gateway Interface (CGI), Life cycle of a Servlet, deploying a servlet, The Servlet API, Reading Servlet parameters, Reading Initialization parameters, Handling Http Request & Responses, Using Cookies and Sessions, connecting to a database using JDBC.

UNIT - IV
Introduction to JSP: The Anatomy of a JSP Page, JSP Processing, Declarations, Directives, Expressions, Code Snippets, implicit objects, Using Beans in JSP Pages, Using Cookies, and session for session tracking, connecting to database in JSP

UNIT – V
Database Design using MySQL: An Overview of SQL, XAMPP and MySQL Setup, Create Tables, Columns and Insert Data, Selecting Data, Distinct, Aliases & Concat, Update, Delete & Alter, Foreign Keys, Table Joins.
PHP Programming Fundamentals, PHP Data Types & Dates, Cookies, Sessions, Objects and Classes, Intro to PHP & MySQL, creating a MySQL Database, Connect & Fetch data from MySQL, Insert and Delete MySQL data from PHP.

Textbooks:
1. Web Programming, building internet applications, Chris Bates 2nd edition, WILEYDreamtech
2. Learning AngularJS: A Guide to AngularJS Development, Ken Williamson, O'Reilly
3. Java Server Pages –Hans Bergsten, SPD O'Reilly
4. The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of aModern Full Stack Web Developer 1st ed. Edition, Kindle Edition by Chris Northwood

References:
1. Quick Start Full Stack Web Development: Build Secure Asynchronous Single-PageApps with Flask, React, and PostgreSQL by Erik M. Ferragut (Author)

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

APPLIED STATISTICS FOR ENGINEERS

Course Code: GR22A2006   **L/T/P/C:3/0/0/3**
II Year II Semester

Pre-requisites: Elementary statistics, Calculus and Linear algebra
Course Outcomes
1. Compute and interpret descriptive statistics.
2. Make use of the properties of   Binomial, Poisson, Normal and Exponentialdistributions to estimate the variability of occurrence
3. Analyze univariate and bivariate data using statistical modelling
4. Apply inferential statistics to suggest explanations for a situation arising in the case oflarge and small samples
5. Apply non parametric tests when the sampled data is distribution-free

UNIT I
Basic Statistics and Random Variables
Measures of central tendency, moments, Skewness and Kurtosis.
Random variables- Discrete&Continuous, Probability mass function and density functions,constants of random variables(Mean,Variance and Moments about mean), Concepts of Bivariate distributions and Covariance.

UNIT II
Discrete and Continuous Probability Distributions
Binomial, Poisson, Normal and Exponential (Properties and applications), evaluation of statistical parameters for Binomial, Poisson and Normal distributions.

UNIT III
Correlation, Regression and Time Series analysis
Correlation(Karl-Pearson's correlation coefficient and Spearman's Rank correlation (Statements of their properties and problems)), Simple and Multiple Linear Regression of three variables (Statements of properties of Regression coefficients and problems).
Components of Time series, Additive and Multiplicative models of Decomposition of Time series, Estimation of trend by method of Moving averages, fitting of various mathematical curves (Straight line and Second degree parabola).

UNIT IV
Testing of Hypothesis-1
Concept of Sampling distribution and Standard error; tests for single proportion, difference ofproportions in large sampling, single mean and difference of means in large and small sampling .Estimation of confidence interval for population mean and population proportions.

UNIT V
Testing of Hypothesis-2
Tests for Population variance, ratio of variances, ANOVA 1-way and 2-way.
Non-parametric Inference: Comparison with parametric inference, Use of order statistics.Wilcoxon signed rank test, Mann-Whitney U- test and Run test.
Chi-square test for independence of attributes.

Text Books and References:

1. S. C.Gupta &V.K.Kapoor, "Fundamentals of Mathematical Statistics", S.Chand.
2. Richard A.Johnson," Probability and Statistics for Engineers", Pearson Education.
3. Jay Devore, "Probability and Statistics for Engineering and the Sciences",Cengagelearning.
4. Murat Kulahci,"Time series analysis and forecasting by example",John Wiley &Sons.
5. S. C.Gupta &V.K.Kapoor, "Fundamentals of Applied Statistics", S.Chand.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

FULL STACK WEB DEVELOPMENT LAB

Course code: GR22A2078   **L/T/P/C:0/0/3/1.5**
II Year II Semester

Prerequisites:
Knowledge of Object Oriented Programming concepts

Course Outcomes:
1. To design a website
2. To implement client-side validation.
3. To develop the robust and scalable websites, backend APIs
4. To implement end-to-end applications.
5. To design web applications with database connectivity.

TASK 1
Develop a website by implementing JavaScript functions for the following problems:Parameter: A string
Output: The position in the string of the left-most vowel Parameter: A numberOutput: The number with its
digits in the reverse order

TASK 2
Write a JavaScript program to calculate the squares and cubes of the numbers from 0 to 10and outputs
HTML text that displays the resulting values in an HTML table format.

TASK 3
Write a JavaScript program to display text "TEXT-GROWING" with increasing font size in the interval
of 100ms in RED COLOR, when the font size reaches 50pt it displays "TEXT-SHRINKING" in BLUE
color. Then the font size decreases to 5pt.

TASK 4
Write a JavaScript program to design a simple calculator to perform the followingoperations: sum,
product, difference and quotient

TASK 5
Write a JQuery AJAX program to request data from the server with an HTTP.

TASK 6
Create following Student Information form with submit and reset functionality usingAngular JS.

Sample AngularJS Form.

TASK 7

Use AngularJS features to make a shopping list, where you can add or remove items as shown below.

My Shopping List

- Milk×
- Bread×

- Cheese×

Add

TASK 8

Write a Servlet Program that accepts the Mobile phone details from user and displays the details on the next page. Create a table and perform insert operation as shown in the Figure 1 below. Connect using JDBC to display each record at a time on the webpage using servlet request and response.

Figure 1: Table Details

Mobile Details

Model Id	Price(Rs.)	Company	Color
J2	12000	Samsung	Silver
6600	20000	Nokia	Black
Note 3	12000	Red Mi	Grey
Zenfone 2	20000	Asus	Grey

TASK 9

Develop a JSP Program to validate a particular user login based on the username password stored in the database and display a welcome page.

TASK 10
Write PHP programs to do the following tasks:
a. Implement simple calculator operations.
b. Find the transpose of a matrix.
c. Multiplication of two matrices.
d. Addition of two matrices.

TASK 11
Write a PHP program named states.py that declares a variable states with value "Mississippi Alabama Texas Massachusetts Kansas". Write a PHP program that does the following:
a. Search for a word in variable states that ends in xas. Store this word in element 0 of a list named statesList.
b. Search for a word in states that begins with k and ends in s. Perform a case insensitive comparison. [Note: Passing re.Ias a second parameter to method compile performs a case-insensitive comparison.] Store this word in element1 of statesList.
c. Search for a word in states that begins with M and ends in s. Storethis word in element 2 of the list.
d. Search for a word in states that ends in a. Store this word in element 3of the list.

TASK 12
Write a PHP program to sort the student records which are stored in the database using selection sort.

Text books:
1. Modern Full-Stack Development: Using TypeScript, React, Node.js, Webpack, and Docker 1st ed. Edition by Frank Zammetti
2. Web Design with HTML, CSS, JavaScript and jQuery Set 1st Edition by Jon Duckett
3. The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer 1st ed. Edition, Kindle Edition by Chris Northwood

References:
1. Quick Start Full Stack Web Development: Build Secure Asynchronous Single- Page Apps with Flask, React, and PostgreSQL by Erik M. Ferragut (Author)
2. Full Stack Web Development For Beginners: Learn Ecommerce Web Development Using HTML5, CSS3, Bootstrap, JavaScript, MySQL, and PHP by Riaz Ahmed.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
OPERATING SYSTEMS LAB

Course Code: GR22A2079   **L/T/P/C: 0/0/3/1.5**
 II Year II Semester

Course Outcomes:
1. Evaluate the performance of different types of CPU scheduling algorithms
2. Implement   producer-consumer problem,reader-writersproblem,and Diningphilosophers' problem using semaphores.
3. Simulate Banker's algorithm for deadlock avoidance
4. Implement paging techniques and page replacement policies, memory allocationtechniques in memory management.
5. Implement disk scheduling techniques and file allocation strategies .

TASK 1
Practice the following commands in UNIX environment
a) cp   b) rm   c) mv   d) chmod   e) ps   f) kill

TASK 2
Write a program that makes a copy of a file using standard I/O and system calls.

TASK 3
Simulate the following Scheduling algorithms.
a) FCFS   b)SJF   c)Priority   d)Round Robin

TASK 4
Simulate the Producer Consumer problem using semaphores.

TASK 5
Simulate the Readers – Writers problem using semaphores.

TASK 6
Simulate the Dining Philosophers problem using semaphores

TASK 7
Simulate Bankers Algorithm for Deadlock Avoidance.

TASK 8
Simulate First Fit and Best Fit algorithms for Memory Management.

TASK 9
Simulate paging technique of memory management.

TASK 10
Simulate page replacement Algorithms.a)FIFO b)LRU

TASK 11

Simulate following Disk Scheduling algorithms.

a)FCFS   b)SSTF   c)SCAN   d)C-SCAN
e)LOOK   f)C-LOOK

TASK 12

Simulate file allocation strategies.
a)Sequential   b)Indexed   c)Linked

Text Books/ References:

1. Operating System Concepts- Abraham Silberchatz , Peter B. Galvin, Greg Gagne7th Edition, JohnWiley.

2. Operating Systems– Internal and Design Principles Stallings, Fifth Edition–2005,Pearson education/PHI.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DATA SCIENCE WITH R PROGRAMMING LAB

Course Code: GR22A2087   **L/T/P/C: 0/0/4/2**
II Year II Semester

Course Outcomes:
1. Demonstrate to use R in any OS (Windows / Mac / Linux). Able to work with Rpackages and their installation.
2. Demonstrate exploratory data analysis (EDA) for a given data set.
3. Understand to produce effective visualization for the given data set.
4. Implement and assess relevance and effectiveness of machine learning algorithms for a given dataset.
5. To be able to use and program in the programming language R be able to use R to solve statistical problems, able to implement and describe Monte Carlo the technology, able to minimize and maximize functions using R.

TASK 1
a) Write R script for Vector creation and Data Frames
b) Implement data analysis and data visualization in R

TASK 2
a) Implement linear and multiple regression model using one variable and multiplevariables
b) Calculate the Error measures SSE, SST, RMSE, and R2
c) Implement Lasso and ridge regression Correlation using R

TASK 3
a) Perform logistic regression using R script
b) Evaluating model accuracy using confusion matrix using R
c) Implement ROC curve with threshold selection and Area under the ROC curve.

TASK 4
a) Create the decision tree model using ctree and plot the model
b) Implement single data imputation and multiple imputation

TASK 5
a) Create Classification and Regression Tress with cross validation
b) Implement ROC curve for CART

TASK6
a) Implement Random Forest using R
b) Implement K-fold Cross Validation using R

TASK 7
a) Write R Script for Text Analytics

TASK 8
a) Implement Time Series Analysis in R

TASK 9
a) Implement clustering and Random forest with clustering using R
b) Implement Heatmaps Using R

TASK 10
a) Implement Support Vector Machines using R
b) Implement Naive Bayes - Bayesian GLM using R

Note: min 3 data sets for practice.

Text/Reference Books
1. William N. Venables and David M. Smith, An Introduction to R. 2nd Edition. NetworkTheory Limited, 2009.
2. Norman Matloff, The Art of R Programming - A Tour of Statistical Software Design, No Starch Press, 2011.
3. Hands-on programming with R, Garrett Grolemund, O'Reilley, 1st Edition, 2014.
4. Statistics: An Introduction Using R, Michael J. Crawley, WILEY, Second Edition, 2015.
5. R for everyone, Jared Lander, Pearson, 1st Edition, 2014.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ENVIRONMENTAL SCIENCE

Course Code: GR22A2001   **L/T/P/C: 2/0/0/0**
II Year II Semester

Course Pre-Requisites: Basic knowledge of environmental issues

Course Outcomes:
1. Gain a variety of experiences & acquire a basic knowledge about the environment & its allied problems
2. Interpret the key components in safe guarding the environment
3. Evolve an individual vision of harmonious interaction with natural world.
4. Appraise the quality of environment in order to create a healthy atmosphere
5. Familiarize with the individual responsibilities towards green revolution

UNIT I
INTRODUCTION AND AWARENESS ACTIVITIES
Environmental Science: Introduction, Definition, scope and importance. AWARENESS ACTIVITIES
Small group meetings about:
- Water management
- Waste water treatment
- Projects Vs Environment
- Zero waste management
- Circular economy
- Impact of Science & Technology on Environment
- E-waste management
- Biodiversity loss
- Renewable Energy

UNIT II
SLOGAN AND POSTER MAKING EVENT
- Food waste management
- Rain water harvesting
- Climate change
- Green Power
- Water conservation
- Green at work
- Role of IT in environment and human health
- Sustainable development

UNIT III
EXPERT LECTURES ON ENVIRONMENTAL SCIENCE
- Environmental Impact Assessment
- Industrial waste treatment
- Regenerative farming/Organic farming/Vertical gardens/Hydroponics
- Circular Economy

UNIT IV CLEANLINESS DRIVE
- Indoor air pollution
- Vehicular pollution
- Visual pollution
- Waste management at home
- Composting
- Plastic recycling

UNIT V
CASE STUDIES
- HPCL and LG Polymers disasters in Vizag
- Oleum gas leak in Delhi
- Mathura Refinery & Taj Mahal
- Conservation of Hussain Sagar lake
- The Cleanliest city of India-Surat
- Green Buildings in India
- KBR park in Hyderabad (Environmental protection Vs Development)
- Fluorosis and remediation
- Evaluation of STP or ETP operation in Hyderabad
- Ecotourism & its impacts
- Positive Impact on Environment due to Lockdown Forced by Corona Pandemic

TEXT BOOKS:
1. Environmental Studies for UG Courses, Erach Bharucha, UGC Publications, Delhi, 2004.
2. Textbook of Environmental Studies, Deeksha Dave, S. S. Katewa, Cengage Delmar LearningIndia Pvt., 2012.

REFERENCES:
1. Introduction to Environmental Science, Y. Anjaneyulu, BS Publications, 2004.
2. Environmental Studies, Anubha Kaushik & C. P. Kaushik, 4th Edition, New Age InternationalPublishers

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
EFFECTIVE TECHNICAL COMMUNICATION

Course Code: GR22A2108   **L/T/P/C:2/0/0/0**
II Year II Semester

Course Outcomes:

1. Demonstrate proficiency in producing well-structured technical documents adhering to standard writing conventions and industry-specific guidelines.
2. Develop critical analysis skills to assess and evaluate technical documents.
3. Develop a habit of lifelong learning in technical communication, recognizing its importance in their personal and professional growth.
4. Exhibit effective oral communication skills by delivering technical presentations with clarity, coherence, and appropriate use of visual aids.
5. Exemplify intercultural competence in technical communication.

UNIT- I
Information Design and Development- Different kinds of technical documents, Information development life cycle, Organization structures, Factors affecting information and document design, Strategies for organization, Information design and writing for print and for online media, Artificial Intelligence - Voice of the future, Everyday life, Communicating with Machines.

UNIT-II
Technical Writing, Grammar, and Editing- Abstract Writing, Technical writing process, forms of discourse, Collaborative writing, creating indexes, technical writing style and language, Basics of grammar, and study of advanced grammar, Introduction to Digital Humanities, Managing technical communication projects, Time estimation, Single sourcing, Localization.

UNIT-III
Self-Development and Assessment- SWOT, Self-assessment, Awareness, Perception and Attitudes, Values and belief, Personal goal setting, Career planning, Self-esteem, Managing Time, Personal memory, Taking notes, Complex problem-solving, Stress Management, Working with Rhythm and Balance, Emotional Intelligence, Six Hats of Thinking.

UNIT-IV
Communication and Technical Writing- Group discussion, Oral presentation, Resume writing, Interview skills, Graphic presentation, Personality Development, Technical articles, Official notes, Memos, and Minutes of meetings.

UNIT-V
Ethics- Business ethics- Corporate Social Responsibility-importance, need, stories, Engineering Ethics, Role and responsibility of engineer, Work culture in jobs.

Textbooks:
1. M Ashraf Rizvi, Effective Technical Communication, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2018.

Reference Books:
1. Raman Sharma, Technical Communication, Oxford Publication, London, 2013.
2. Meenakshi Raman, Shalini Upadhyay, SOFT SKILLS Key to Success in Workplace and Life, Cengage Learning India Pvt. Ltd., Delhi, 2018.
3. Ron Cowan, The teacher's Grammar of English, CAMBRIDGE UNIVERSITY PRESS,New Delhi,2008.
4. Shiv Khera, You Can Win, Macmillian Books, New York, 2003.
5. Arthur D. Rosenberg, David Hizer, The Resume Handbook, Adams Media, an F+W Publications Company, 57 Littlefield Street,Avon, MA02322,USA.
6. M. Kay DuPont, Business Etiquette & Professionalism, Viva Books private Limited, Hyd.,2005
7. David F. Beer and David McMurrey, Guide to Writing as an Engineer, John Willey, New York, 2004

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

REAL-TIME RESEARCH PROJECT/ SOCIETAL RELATED PROJECT

Course Code: GR22A2109   **L/T/P/C:0/0/4/2**
II Year II Semester

Course Outcomes:

At the end of this course, students will be able to:

1. Predict the Field domain in the specialized area under Engineering discipline.
2. Evaluate and Obtained the category of the solution with help of Real time studies
3. Analyse and Discuss the field problems using software tools /Modes/simulations and experimental investigations.
4. Implementing the solution of problem statement.
5. Prioritize the reports and deliver the final work with presentation.

III YEAR
I SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ARTIFICIAL INTELLIGENCE

Course Code: GR22A3070   **L/T/P/C: 3/0/0/3**
III Year I Semester

Prerequisites:

A Course in Artificial intelligence would require the knowledge of following concepts
- Logic Theory
- Probability Theory
- Numerical Analysis
- Operations on Matrices

Course Outcomes:

1. Select an appropriate searching strategy for developing intelligent agents to find solution in optimized way using building blocks of AI.
2. Apply Prepositional and First Order Logic methods to resolve decisions for Knowledge-based agents.
3. Practice uncertain knowledge and reasoning handling using Bayesian Networks.
4. Analyze the working of temporal model, Hidden Markov Model, and Decision trees.
5. Breakdown the steps to construct small robot capable of performing perception and movement based on techniques learnt in the course.

UNIT I

Introduction to AI: Introduction, Foundation of AI, History of Intelligent Agents, Agents and environments, Concept of Rationality, Nature of environments & Structure of Agents, Problem solving agents and formulation, Searching For Solutions and Strategies, Uninformed search strategies BFS, DFS, Heuristic approach, Greedy best search, A* Search, Game Playing: Adversal search, Games, Min-Max algorithm, Optimal decisions in multiplayer games, Alpha Beta pruning.

UNIT II

Knowledge Representation & Reasons: Logical agents, Knowledge based agents, The Wumpus world, Logic: Proportional logic, Resolution patterns in proportional logics, Resolution: Forward and Backward chaining, First order logic: Inference in First order logic, Proportional vs first order inference, Unification & Lifting, forward chaining, Resolution, Practice problems.

UNIT III

Uncertain Knowledge and Reasoning: Uncertainty-Acting under uncertainty, Basic probability notion, the axioms of probability, inference using full joint distribution, Independence, Bayes' rule.
Probabilistic Reasoning: Representing Knowledge in uncertain domain, the semantics of Bayesian networks, efficient representations of conditional distributions, exact inference in Bayesian networks, approximate inference in Bayesian networks.

UNIT IV

Probabilistic reasoning over time: Time and uncertainty, inference in temporal model, Hidden Markov models.
Planning: Overview, Components of Planning, Conditional Planning, Goal Stack Planning.
Learning: Learning from observations: Forms of learning, inductive learning, learning decision trees, ensemble learning, why learning works.

UNIT V

Perception: Image formation, Early Image Processing operations- Edge detection, image segmentation. Object recognition, using vision for manipulation and navigation.

Robotics: Introduction, Robot hardware, robotic perception, planning to move, robotic software architectures, application domains.

Introduction to Expert Systems, Conversational AI, Generative AI.

Text Book:

1. Artificial Intelligence: A Modern Approach, Staurt Russel, Peter Norvig, 4th Edition,Pearson

Reference Books:

1. Artificial Intelligence, Elaine Riche & Kevin Night, 2nd Edition, Tata McGraw HillEducation Pvt Ltd.
2. Artificial Intelligence, Kevin Knight, Elaine Rich, Shivashankar B. Nair, 3rd Edition,McGraw Hill Education Pvt Ltd.
3. Paradigms of Artificial Intelligence Programming, Case Studies in Common Lisp, PeterNorvig, Morgan Kaufmann Publisher.
4. Robotics: Fundamental Concepts and Analysis, Ashitava Goshal, Oxford Publisher.
5. A Textbook of Robotics 1: Basic Concepts, M. Shoham, Springer Publisher.
6. Introduction to Artificial Intelligence and Expert Systems, Dan W. Patterson, 1st Edition,Pearson Education India.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DATA WAREHOUSING AND DATA MINING

Course Code:GR22A3069   **L/T/P/C: 3/0/0/3**
III Year I Semester

Prerequisites:
Students are expected to have knowledge of transactional and relational databases, probabilityand statistics.

Course Outcomes:
1. Demonstrate the concepts of data mining, its applications, and various pre-processingmethods.
2. Develop a prototype for data warehouse and data mart for any organization.
3. Apply different types of association rule mining techniques for solving practicalproblems.
4. Implement classification models and algorithms in data warehouses and data mining.
5. Analyze clustering techniques and recent trends in advanced data mining techniques.

UNIT I
Introduction: Why Data mining, What is Data Mining, What Kinds of Data Can Be Mined, What Kinds of Patterns Can Be Mined, Which Technologies are used, Data Mining Task Primitives, Integration of a Data Mining System witha Database or a Data Warehouse System,Major issues in Data Mining.

Data Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction.

UNIT II
Data Warehouse and Online Analytical Processing: Data Warehouse-Basic concepts, Data Warehouse Modeling - Multidimensional Data Model, Star, Snowflake, Fact Constellation Schemas, Concept Hierarchies, Measures, Typical OLAP Operations, From Data Warehousing to Data Mining.

Data Warehouse Implementation - Efficient Data Cube Computation: Overview, Indexing OLAP Data – Bitmap Index, Join Index.

UNIT III
Data Characterization and Discrimination: Data Generalization by Attribute-Oriented Induction.

Mining Frequent Patterns, Associations and Correlations: Basic Concepts, Market Basket Analysis, Efficient and Scalable Frequent Item set Mining Methods, Mining various kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining.

UNIT IV
Classification: Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Classification by Back propagation, k-Nearest-Neighbor Classifiers.

Prediction: Introduction to Regression techniques, Linear Regression.

Accuracy and Error measures: Classifier Error measures, Predictor Error Measures, Evaluating the accuracy of Classifier and Predictor.

UNIT V

Cluster Analysis: What is Cluster Analysis, Types of Data in Cluster Analysis,Categorization of Major Clustering Methods, Partitioning Methods - *k*-Means, *k*-Mediods,Hierarchical Methods - AGNES and DIANA, Density-Based Methods - DBSCAN. **Introduction to Mining Complex Data Types:** Mining Data Streams, Mining Time- Series

Data, Mining Sequence Patterns in Transactional Databases, Mining Complex Data Objects,Spatial Data Mining, Multimedia Data Mining, Text Mining, Mining the World Wide Web.

Teaching Methodologies:
- Power Point Presentations
- Tutorial Sheets
- Assignments

Textbooks:
1. Data Mining Concepts and Techniques - Jiawei Han & Micheline Kamber, MorganKaufmann Publishers, Elsevier, Third Edition, 2012.
2. Data Mining Concepts and Techniques - Jiawei Han & Micheline Kamber, MorganKaufmann Publishers, Elsevier, Second Edition, 2006.
3. Introduction to Data Mining – Pang-Ning Tan, Michael Steinbach and Vipin Kumar,Pearson education.

References:
1. Data Mining Techniques – Arun K. Pujari, Second Edition, Universities Press.
2. Data Warehousing in the Real World, Sam Aanhory and Dennis Murray, PearsonEdn Asia.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DATA VISUALIZATION

Course code: GR22A3076   **L/T/P/C:3/0/0/3**
III Year I Semester

Course Outcomes:

1. Apply the visualization process for creating visual representations.
2. Learns the tableau terminologies and its fields.
3. Explores tableau prep tool for visualization
4. Classify visualization techniques for different types of data
5. Summarize the recent trends in visualization techniques and Apply visualizationtechniques for GIS , maps . their applications for real world problems.

UNIT I

Introduction to Visualization, Visualization process, visual representation of data, Gestalt principles, information overloads. Creating visual representations, visualization reference model, visual mapping, visual analytics, Design of visualization applications.

UNIT II

Introduction to Tableau: Tableau Architecture, Tableau Server Architecture VizQL, Foundations for building visualizations Measures and dimensions, Visualizing data: Bar charts, Iterations of bar charts for deeper analysis, Line charts, Geographic visualization, Using Show Me, Putting everything together in a dashboard, The dashboard interface, Building your dashboard, , Connecting to Data in Tableau , Managing data source metadata, Working with extracts instead of live connections, Filtering data, Understanding the Tableau Data Model, Joins, and Blends, Structuring Messy Data to Work Well in Tableau. Telling a Data Story with Dashboards

UNIT III

Tableau Prep Builder:
introduction to Tableau Prep, Tableau Prep Builder User Interface, Data Preparation techniques using Tableau Prep Builder tool, Flowing with the fundamental paradigm: Connecting to data, Cleaning the data, Unioning, merging mismatched fields, and removing unnecessary fields, Grouping and cleaning, Calculations and aggregations in Tableau Prep: Row-level calculations, Level of detail calculations, Aggregation, Filtering data in Tableau Prep, Transforming the data for analysis ,Options for automating flows

UNIT IV

Classification of visualization systems, Interaction and visualization techniques misleading, Visualization of one, two and multi-dimensional data, text and text documents. Visualization of groups, trees, graphs, clusters, networks, Metaphorical visualization.

UNIT V

Visualization of volumetric data, vector fields, Visualization of maps, geographic information,GIS systems
Perception: Pre attentive Properties ,Color ,Form ,Spatial Position , Advanced visualization: Slope charts and bump charts, Waterfall charts, Step lines and jump lines, Sparklines, Dumbbell charts, Unit/symbol charts, Marimekko chart, Animated visualizations

Text Books:

1. Matthew Ward Georges Grinstein Daniel Keim , Interactive Data Visualization:Foundations, Techniques, and Applications. A K Peters, Ltd. Natick.
2. Learning Tableau 2020: Create effective data visualizations, build interactivevisual analytics, and transform your organization, 4th Edition, 2020
3. Riccardo Mazza, Introduction to Information Visualization, Springer London,Published: 02 April 2009,**eBook ISBN**978-1-84800-219-7

Reference Books:

1. A Practitioner's Guide to Tableau Prep Builder. USEReady.
2. Hand book of data visualization ,chun-houh chen,wolfgang hardle,Antonyunwin

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

MOBILE APPLICATION DEVELOPMENT

(Professional Elective - I)

Course code: GR22A3125   **L/T/P/C: 3/0/0/3**

III Year I Semester

Course Outcomes: At the end of the course the student will be able to

1. Design simple GUI applications.

2. Apply key technological principles and methods for de-livering and maintaining mobile applications on Android devices.

3. Make use of built-in widgets and components.

4. Design apps which uses the database to store data locally.

5. Develop the apps that make use of interfaces with built-in views.

UNIT I

Java Concepts: OOPs Concepts, Inheritance in detail, Exception handling, Packages &interfaces, Multi-threading, JVM & .jar file extension, SQL-DML and DDL Queries.

UNIT II

Introduction to Android: What is Android? Setting up development environment, Dalvik Virtual Machine & .apk file extension, Fundamentals: Basic Building blocks - Activities, Services, and Broadcast Receivers & Content providers. UI Components - Views & notifications. Components for communication -Intents & Intent Filters, Android API levels (versions & version names).

UNIT III

Application Structure (in detail): Android Manifest.xml, uses-permission & uses-sdk, Resources & R.java, Assets, Layouts & Drawable Resources, Activities and Activity lifecycle, First sample Application

Emulator-Android Virtual Device: Launching emulator, editing emulator settings, Introduction to DDMS, Basic UI design, Preferences, Menu, Intents- Implicit Intents, Explicit Intents.

UNIT IV

Content Providers: SQLite Programming, SQLite OpenHelper, SQLite Database, Cursor,Reading and updating Contacts, Reading bookmarks, Examples.

UNIT V

Threads: Threads running on UI thread (runOnUiThread), Worker thread, Handlers &Runnable, AsynTask, and Examples.

UI design, Tabs and Tab Activity, Styles & Themes, Examples.

Text Books:

1. Android Programming for Beginners - Second Edition: Build in-depth, full-featured Android 9 Pie apps starting from zero programming experience, 2nd Edition by John Horton

2. Head First Android Development: A Brain-Friendly Guide by Dawn Griffiths Android Cookbook: Problems and Solutions for Android Developers, Second Edition

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
CLOUD COMPUTING
(PROFESSIONAL ELECTIVE-I)

Course Code: GR22A3126   **L/T/P/C: 3/0/0/3**
III Year I Semester

Prerequisites:
Students are expected to have knowledge on Operating systems, Virtualization and Networking

Course Outcomes:
1. Identify varies features, advantages and challenges of cloud computing, compare their operation, implementation and performance
2. Applying knowledge of Virtualization, Analyze and compare different types of clouds and cloud services.
3. Validating the financial and technological implications in selecting cloud computing paradigm for an organization.
4. Compare operation and economic models of varies trending cloud platforms in IT Industry.
5. To know how to overcome the security challenges and risks involved in the cloud.

UNIT I
Understanding Cloud Computing: Cloud Computing, Introduction to Cloud Computing, Cloud Architecture and Cloud Services (IaaS, PaaS, SaaS) , Cloud models– Public vs Private, Cloud Technologies for Network-Based System , System Models for Distributed and Cloud Computing , NIST Cloud Computing Reference Architecture

UNIT II
Virtualization: Basics of Virtualization, Types of Virtualizations, Implementation Levels of Virtualization, Virtualization Structures, Tools and Mechanisms, Virtualization of CPU, Memory, I/O Devices, Virtual Clusters and Resource management, Virtualization for Data-centre Automation

UNIT III
Cloud Infrastructure: Architectural Design of Compute and Storage Clouds, Layered Cloud Architecture Development, Design Challenges, Inter Cloud Resource Management, Resource Provisioning and Platform Deployment, Global Exchange of Cloud Resources

UNIT IV
Programming Model: Parallel and Distributed Programming Paradigms, Map Reduce, Twister and Iterative Map Reduce, Hadoop Library from Apache, Mapping Applications, Programming Support, Google App Engine, Amazon AWS, Cloud Software Environments, Eucalyptus, Working with EC2 API, Open Nebula, Open Stack, Aneka, CloudSim

UNIT V
Security in the Cloud: Security Overview, Cloud Security Challenges and Risks, Software- as-a Service Security, Security Governance, Risk Management, Security Monitoring, Security Architecture Design,

Data Security, Application Security, Virtual Machine Security, Identity Management and Access Control, Autonomic Security

Text Books:

1. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud"O'Reilly
2. Kumar Saurabh, "Cloud Computing, insights into New-Era Infrastructure", Wiley India.
3. RajkumarBuyya, Christian Vecchiola, S.TamaraiSelvi, 'Mastering Cloud Computing", TMGH.

References:

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers.
2. John W. Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press.
3. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach", TMH.
4. Ronald L. Krutz, Russell Dean Vines, "Cloud Security, A comprehensive Guide to Secure Cloud Computing", Wiley, India.
5. Nick Antonopoulos, Cloud computing, Springer Publications.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
COMPUTER NETWORKS
(PROFESSIONAL ELECTIVE – I)

Course Code:GR22A3044   **L/T/P/C: 3/0/0/3**
III Year I Semester

Pre-requisites:
Students are expected to have knowledge in
- Basic computer hardware
- Multi user Operating systems
- Types of Ports and their purpose

Course Outcomes:
1. Articulate basic terminologies of Computer Networks and transmission media in buildinga network for an organization.
2. Interpret the error correction and detection techniques and MAC Protocols forspecific networks.
3. Illustrate the purpose of routing algorithms in real time applications.
4. Mind map the protocols and mechanism used in transport layer.
5. Integrate the application layer protocols in Internet based Applications.

UNIT I
Computer Networks: Uses of Computer Networks, Network Hardware, Network Software, Types of networks, Network topologies, Layered architecture. Reference Models: OSI, TCP/IP, ARPANET, Internet, and ATM header, Reference model, QoS.
Physical Layer: Guided Transmission Media, Wireless Transmission Media, Communication Satellites. Switching and Multiplexing, Mobile Telephone Network, GSM.

UNIT II
Data link layer: Design Issues, Framing, Error Detection, Elementary Data Link Protocol, and Sliding Window Protocols.
Medium Access sub layer: Static vs. Dynamic, Multiple Access Protocols: ALOHA, CSMA and Collision Free Protocols. Ethernet (IEEE 802.3), wireless LANS (IEEE 802.11), Bluetooth (IEEE 802.15), The Network and internetwork devices.

UNIT III
Network Layer: Routing Algorithms, Flooding, Broadcasting and Multicasting. Congestion Control Algorithms: General Principles of Congestion Control, Prevention Policies, Congestion Control in Virtual and Datagram Subnets, QoS in the Internet.

The Network Layer in the Internet: IPv4 Addressing Scheme, Subnetting and Masking, CIDR, NAT, Intra and Inter domain routing protocols, Mobile IP, IPv6 Header Format and Transmission Methods.

UNIT IV
Transport Layer: Transport Services, Elements of Transport Protocols.
Transport Layer Protocols: TCP & UDP protocols, TCP Connection Establishment andRelease, TCP

Congestion Control, TCP Fast Retransmit and Recovery, Slow start Mechanism in TCP, Transaction Oriented TCP.

UNIT V

Application Layer: DNS, Electronic Mail, the World Wide Web, FTP, HTTP, TELNET.
Multimedia: Audio and video compression techniques, streaming audio and video, VOIP.

Teaching Methodologies:
- Power Point Presentations
- Tutorial Sheets
- Assignments

Text Books:
1. Computer Networks - Andrew S Tanenbaum, 4th Edition, Pearson Education/PHI
2. Data Communications and Networking-Behrouz A. Forouzan, Third Edition TMH.

References:
1. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition,PearsonEducation.
2. Understanding communications and Networks- 3rd Edition, W.A. Shay,Thomson
3. Computer Networks – Dr.G.S.Bapiraju, 2nd Edition GRIET Publications.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
GRAPH THEORY
(PROFESSIONAL ELECTIVE – I)

Course Code: GR22A3045   **L/T/P/C: 3/0/0/3**
III Year I Semester

Prerequisites:

Students are expected to have knowledge in Discrete Mathematics, Design and Analysis of Algorithms

Course Outcomes:

1. Summarize the concepts of Paths, Circuits and Graphs.
2. Illustrate the idea of using trees, cut-sets and cut-vertices.
3. Implement planar and Dual graphs with matrix representation.
4. Develop solutions using coloring, covering and partitioning of graphs.
5. Construct algorithms for graph related problems.

UNIT I

Introduction: Graph, Applications, Finite and Infinite graphs, Incidence and Degree, Isolated Vertex, Pendant Vertex, Null Graph.

Paths and Circuits: Isomorphism, Sub-graphs, Walks, Paths and Circuits, Connected Graphs, Disconnected Graphs, Components, Euler Graphs, Hamiltonian Paths and Circuits, Travelling Salesman Problem.

Directed Graphs: Directed Graph, Types of Digraphs, Digraphs and Binary Relations, Directed Paths and Connectedness, Euler Digraphs, Trees with Directed Edges, Fundamental Circuits in Digraphs, Matrices Digraphs, Adjacency Matrix of a Digraph.

UNIT II

Trees: Properties, Pendant Vertex, Distance and Centers, Rooted and Binary Tree, Counting Trees, Spanning Trees, Finding all Spanning Tress of a Graph, Spanning Trees in a Weighted Graph.

Cut-Sets and Cut-Vertices: Properties, All Cut-sets in a Graph, Fundamental Circuits and Cut-Sets, Connectivity and Separability, Network Flows, 1-Isomorphisn,2-Isomorphism.

UNIT III

Planar and Dual Graphs: Planar graphs, Different representations of planar graphs, Detection of Planarity, Geometric dual, Combinatorial dual.

Matrix Representation of Graphs: Incidence Matrix, Circuit Matrix, Fundamental Circuit Matrix and Rank, Cut-Set Matrix, Path Matrix, Adjacency Matrix

UNIT IV

Coloring, Covering and Partitioning: Chromatic Number, Chromatic Partitioning, Chromatic Polynomial, Matching, Coverings, The Four Color Problem.

UNIT V

Graphs Theoretic Algorithms: Computer Representation of a Graph, Algorithm for- Connectedness and Components, Spanning tree, Cut-Vertices and Separability, Planarity Testing, Isomorphism, Shortest Path.

Text Books:

1. Narasingh Deo, Graph Theory with Applications to Engineering and Computer Science, PHI.

References:

1. Douglas B. West, Introduction to Graph Theory, Prentice Hall India Ltd.
2. Robin J. Wilson, Introduction to Graph Theory, Longman Group Ltd.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DATA WAREHOUSING AND DATA MINING LAB

Course Code: GR22A3073   **L/T/P/C: 0/0/4/2**
III Year I Semester

Course Outcomes:

1. Learn the concept of creating database tables in attribute relation file format(.arff).
2. Design a database tables in .arff format and insert, modify the data.
3. Apply pre-processing statistical methods for any given raw data.
4. Extract knowledge and implementation of various data mining techniques.
5. Implement data mining algorithms in real time problem solving using weka tool.

Implement the following Tasks using Weka Tool:

(Solve the tasks 1 to 6 by taking given German credit data as case study)

The German Credit Data:

Actual historical credit data is not always easy to come by because of confidentiality rules. Here is one such dataset, consisting of 1000 actual cases collected in Germany. Credit dataset (original) Excel Spreadsheet version of the German credit data (Download from web). In spite of the fact that the data is German, you should probably make use of it for this assignment. (Unless you really can consult a real loan officer).A few notes on the German dataset:

• DM stands for Deutsche Mark, the UNIT of currency, worth about 90 centsCanadian (but looks and acts like aquarter).

• Own_telephone: German phone rates are much higher than in Canada, so fewerpeople own telephones.

• Foreign_worker: There are millions of these in Germany (many from Turkey). It isvery hard to get German citizenship if you were not born of German parents.

• There are 20 attributes in judging a loan applicant. The goal is to classify theapplicant into two categories: good orbad.

TASK 1

List all the categorical (or nominal) attributes and the real-valued attributes separately. What attributes do you think might be crucial in making the credit assessment? Come up with some simple rules in plain English using your selected attributes. One type of model that you can create is a Decision Tree - train a Decision Tree using the complete dataset as the training data.Report the model obtained after training.

TASK 2

Suppose you use your above model (task1) trained on the complete dataset, and classify creditgood/bad for each of the examples in the dataset. What % of examples can you classify correctly? (This is also called testing on the training set) Why do you think you cannot get 100
% training accuracy? Why or Why not? Check to see if the data shows a bias against "foreign workers" (attribute 20),or "personal-status" (attribute 9). Did removing these attributes have any significant effect? Discuss.

TASK 3

Describe what cross-validation is briefly. Train a Decision Tree again using cross-validation and report your results. Does your accuracy increase/decrease? Why?

TASK 4

Another question might be, do you really need to input so many attributes to get good results? Maybe only a few would do. For example, you could try just having attributes 2, 3, 5, 7, 10, 17 (and 21, the class attribute (naturally)). Try out some combinations. Train your Decision Tree again and report the Decision Tree and cross-validation results.

TASK 5

Do you think it is a good idea to prefer simple decision trees instead of having long complex decision trees? How does the complexity of a Decision Tree relate to the bias of the model? You can make your Decision Trees simpler by pruning the nodes. One approach is to use Reduced Error Pruning - Explain this idea briefly. Try reduced error pruning for training your Decision Trees using cross- validation (you can do this in Weka) and report the Decision Tree you obtain? Also, report your accuracy using the pruned model. Does your accuracy increase?

TASK 6

How can you convert a Decision Trees into "if-then-else rules". Make up your own small Decision Tree consisting of 2-3 levels and convert it into a set of rules. There also exist different classifiers that output the model in the form of rules - one such classifier in Weka is rules. PART, train this model and report the set of rules obtained. Sometimes just one attribute can be good enough in making the decision, yes, just one! Can you predict what attribute that might be in this dataset? Report the rule obtained by training a one R classifier. Rank the performance of j48, PART and one R.

TASK 7

(a) Create a data set Student.arff with required data.

(b) Demonstrate preprocessing techniques on dataset Student.arff

TASK 8

(a) Create a data set Employee.arff by adding required data fields.

(b) Apply Association rule mining on dataset Employee.arff (Use Apriori Algorithm)

TASK 9

(a) Create a data set Weather.arff with required fields.

(b) Apply preprocessing techniques on dataset Weather.arff and normalize Weather Tabledata using Knowledge Flow.

TASK 10

(a) Demonstrate classification algorithm on dataset student.arff using j48algorithm

(b) Demonstration of classification rule process on dataset employee.arff using naïve bayesalgorithm

TASK 11

(a) Create a data set customer.arff with required fields.

(b) Write a procedure for Clustering Customer data using Simple K-Means Algorithm.

TASK 12

Demonstration of clustering rule process on dataset student.arff using simple k-means

Text Books:

1. Data Mining– Concepts and Techniques - Jiawei Han &Micheline Kamber,Morgan Kaufmann Publishers, Elsevier, Second Edition,2006.
2. Introduction to Data Mining – Pang-Ning Tan, Michael Steinbach and Vipin Kumar,Pearson education.

References:

1. Data Mining Techniques – Arun K. Pujari, Second Edition, Universities Press.
2. Data Warehousing in the Real World, Sam Aanhory and Dennis Murray, PearsonEdnAsia.
3. www.data.gov.in repository

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ARTIFICIAL INTELLIGENCE LABORATORY USING PYTHON

Course Code:GR22A3074   **L/T/P/C: 0/0/3/1.5**

III Year I Semester

Course Outcomes:
1. Apply the methods for implementing algorithms using AI techniques.
2. Understand various search algorithms and gaming applications.
3. Construct the intelligent agents for specific tasks.
4. Understand the knowledge for reasoning.
5. Apply various learning techniques on text and image data.

List of Experiments / Tasks:
1. (a) Write down a PEAS (Performance Environment Actuators Sensors)-Description for each of the following agents: (i) Playing football (table soccer), (ii) Shot put athlete, (iii) Playing the 2048 Game (http://gabrielecirulli.github.io/2048)
   (b)Characterize the environments of the agents in (a) according to the following criteria: (i) Fully Observable vs. Partially Observable, (ii) Deterministic vs. Stochastic, (iii) Static vs. Dynamic, (iv) Discrete vs. Continuous
2. Write a program to implement table driven vacuum-cleaner agent.
3. Write a program to implement DFS and BFS for the following diagram.
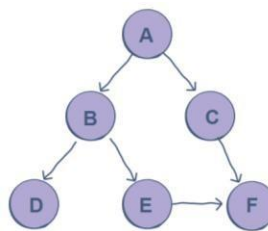
4. Write a program to implement two player games such as Tic-Tac-Toe game and Game of Nimusing easy AI library.
5. Write a program to implement 8 puzzle problem.
6. Write a program to implement A* Algorithm.
7. Write a program to implement Water jug problem.
8. Write a program for Knowledge Representation using Propositional Logic using python logic module.
   Consider the following sentences:
   (a) If it didn't rain, Harry visited Hagrid today,
   (b) Harry visited Hagrid or Dumbledore today, but not both, (c) Harry visited Dumbledore today.
        Based on these three sentences, we can answer the question "did it rain today?"
9. Doctor Black has just been found dead in his mansion yesterday. Yesterday, there were only Three People in Doctor Black's mansion.
   They are the prime suspects: 1. Col. Mustard 2. Prof. Plum 3. Ms. Scarlet. Police found Three Weapons in the mansion: 1. Knife 2. Revolver 3. Wrench. The murder has happened in one of the Three Rooms of the mansion: 1. Ballroom, 2. Kitchen, 3. Library. Find who is the murderer of Dr. Black using implementing propositional logic?
10. Write a program to implement uncertainty using Hidden Markov Model.

11. Write a program to implement Bayes algorithm in the given dataset.

RID	age	income	student	credit_rating	Class: buys_computer
1	youth	high	no	fair	no
2	youth	high	no	excellent	no
3	middle_aged	high	no	fair	yes
4	senior	medium	no	fair	yes
5	senior	low	yes	fair	yes
6	senior	low	yes	excellent	no
7	middle_aged	low	yes	excellent	yes
8	youth	medium	no	fair	no
9	youth	low	yes	fair	yes
10	senior	medium	yes	fair	yes
11	youth	medium	yes	excellent	yes
12	middle_aged	medium	no	excellent	yes
13	middle_aged	high	yes	fair	yes
14	senior	medium	no	excellent	no

Find the class label for the unknown tuple using bayes classifier? X=age=youth, income=medium, student=Yes, Credit_Rating=Fair

12. Write a program for the following:
    a. Use Decision Tree and Ensemble Learning Methods to predict the Diabetes in a dataset (Dataset URL: https://archive.ics.uci.edu/ml/datasets/diabetes)
    b. Detect the face with Haar Cascade using TensorFlow / PyTorch
    c. Explore various Image Processing operations using OpenCV. (For example: Edge Detection, Localization and Segmentation)

Text Book:

1. Artificial Intelligence: A Modern Approach, Staurt Russel, Peter Norvig, 4th Edition, Pearson

Additional Experiments

1. Solve the logic programming for the mathematical expression using necessary librariesHint: pip install kanren, sympy.
2. Demonstrate knowledge representation for the following using open source tools:
    a. Ram likes mango. b. Seemas is a girl. c. Bill likes Cindy. d. Rose is red. e. John owns gold
3. Simulate Rule-Based Response Generation Chatbot use case using Predicate Logic.
4. A person has installed a new alarm system that can be triggered by a burglary or an earthquake. This person also have two neighbors (John and Mary) that are asked to make a call if they hear the alarm. This problem is modeled in a bayesian network with probabilities attached to each edge. Alarm has burglary and earthquake as parents, JohnCalls has Alarm as parent and MaryCalls has Alarm as parent. Build a Bayesian Network to determine the probability for a burglary if both John and Mary calls.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DATA VISUALIZATION LAB

CourseCode: GR22A3078   **L/T/P/C: 0/0/3/1.5**
III Year I Semester

Course Outcomes:
1. Demonstrate knowledge of technical advances through active participation in life-long
2. Discuss concepts and principles of data visualization particularly related to decision making.
3. Investigate technologies and practices for visualizing data as part of a data management and analytics system
4. Conduct research relevant data visualization topics
5. Use existing visualization tools and techniques to analyze basic datasets.

TASK1

Defining data visualization; Visualization workflow: describing data visualization workflow,process in practice.

• Create a bar chart to visualize sales performance by product category.Dataset: Sales data with product categories.

TASK2

1. Experiment Data Representation: chart types: categorical, hierarchical, relational,temporal & spatial;

TASK 3

2-D experiments: bar charts, Clustered bar charts, dot plots, connected dot plots, pictograms,proportional shape charts, bubble charts, radar charts, polar charts,

☐ Build a scatter plot to explore the relationship between two numerical variables (e.g.,revenue vs. profit).(Dataset: Sales data with revenue and profit columns.)

☐ Create a treemap to visualize the distribution of sales across different regions and product categories.Dataset: Sales data with region and product category information.

☐ Create a grouped bar chart to compare total sales and profit for each productcategory.(Dataset: Sales and profit data by product category).

☐   Aggregate data to calculate the average sales per month and visualize it with a linechart. (Dataset: Daily sales data).

TASK 4

Range chart, Box-and- whisker plots, univariate scatter plots, histograms word cloud, pie chart, waffle chart, stacked bar chart, back-to-back bar chart, tree map and all relevant 2-D charts.

☐ Create a range chart to show the variation in product prices within each category.Identify the category with the widest price range.

☐ Generate box-and-whisker plots to compare the distribution of sales across differentproduct categories. Identify any outliers and analyze their impact.

☐ Build a univariate scatter plot to examine the relationship between customersatisfaction ratings and total sales. Determine if there's a correlation.

☐ Create a histogram to visualize the distribution of order quantities. Identify the mostcommon order

quantity range.

□ Generate a word cloud based on customer feedback comments. Identify the mostfrequently mentioned words and themes.

□ Create a pie chart to represent the distribution of sales among various regions. Whichregion contributes the most to overall sales?

□ Build a waffle chart to represent the proportion of sales contributed by each productcategory. Identify the top two categories with the highest contribution.

□ Generate a stacked bar chart to show the contribution of each region to the total sales.Compare the regional contributions visually.

□ Create a back-to-back bar chart to compare the sales performance of two specificproducts. Identify trends and variations.

□ Build a tree map to visualize the hierarchical structure of sales across productcategories and subcategories. Identify the top-selling subcategory.

□ Create a scatter plot to analyze the relationship between product price and customerratings. Identify any patterns or trends

□ Generate a line chart to visualize the monthly sales trend. Identify the months with thehighest and lowest sales.

□ Build a dashboard with multiple visualizations to provide an overview of salesperformance.

TASK 5

Perform Data Cleaning, Data Transformation, Joining and Aggregation, Calculations, DataOutput: Run and Review using Tableau Prep Builder .

TASK 6

Experiment: surfaces, contours, hidden surfaces, pm3d coloring, 3Dmapping.

TASK 7

Program on multi-dimensional data visualization;

TASK 8

Program on manifold visualization;

TASK 9

Program on graph data visualization;

TASK 10

Program Annotation;

TASK 11

Oracle database connectivity using Tableau.

TASK 12

Using Global Superstore, identify the Sub-Categories where Top 20 Customers that haveSales more than the other Sub-Categories in the same Region. ?
Further Analyse the data in 3 different ways

1. PRODUCT LEVEL ANALYSIS
2. CUSTOMER LEVEL ANALYSIS
3. ORDER LEVEL ANALYSIS

Texts/References:

1. Andy Kirk, Data Visualization A Handbook for Data Driven Design, SagePublications,2016
2. Philipp K. Janert, Gnuplot in Action, Understanding Data with GraphsManning Publications, 2010.
3. Sinan ozdemmir , "Principles of Data Science", PacketPublishers-2016

III YEAR
II SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
MACHINE LEARNING

Course Code: GR22A3140   **L/T/P/C: 3/0/0/3**
III Year II Semester

Prerequisites:
1. Mastery of introduction-level algebra, statistics, and probability theory
2. Fundamental knowledge on data modeling and evaluation

Course Outcomes:
1. Explain the concepts machine learning models and able to perform featureengineering techniques.
2. Identify and apply appropriate supervised learning models.
3. Design neural network models for the given data.
4. Perform evaluation on machine learning algorithms and model selection techniques.
5. Devise un-supervised and reinforcement learning models.

UNIT-I
Introduction: Introduction to machine learning, Supervised learning, Unsupervised learning, Semi-supervised learning, Reinforcement learning, Deep learning, Concept learning using find-S algorithm.
Feature Engineering: Feature Selection using Filter, Wrapper, Embedded methods, and Feature normalization using min-max normalization, z-score normalization, and constantfactor normalization,
Introduction to Dimensionality Reduction: Principal Component Analysis (PCA) and Linear Discriminant Analysis (LDA) techniques.

UNIT-II
Supervised Learning – I (Regression and Classification)
Regression models: Simple linear regression, Multiple linear regression. Cost Function,Gradient Descent, Performance Metrics: Mean Absolute Error (MAE), Mean Squared Error (MSE), R-Squared error, Adjusted R Square.
Classification models: Decision Trees-ID3, CART, Naive Bayes, K-Nearest-Neighbours(KNN), Logistic regression, Multinomial logistic regression, Support Vector Machines (SVM).

UNIT-III
Supervised Learning – II (Classification with Neural Networks)
Neural Network Representation: Introduction to Artificial Neural Networks (ANN), Activation Functions, Perceptron and Back Propagation algorithms.
Convolution Neural Networks - Convolution and Pooling layers, Recurrent NeuralNetworks (RNN).
Classification Metrics: Confusion matrix, Precision, Recall, Accuracy, F-Score, ROC curves

UNIT-IV
Model Validation in Classification: Cross Validation - Holdout Method, K-Fold, Stratified K-Fold, Leave-One-Out Cross Validation (LOOC-V).
Bias-Variance tradeoff, Regularization, Overfitting, Underfitting.
Ensemble Methods: Boosting, Bagging, Random Forest classifier.

UNIT-V
Unsupervised Learning: K-means, K-Modes, K-Prototypes, Gaussian Mixture Model clustering algorithms, Expectation-Maximization, BIRCH clustering algorithms.

Reinforcement Learning: Exploration and exploitation trade-offs, non-associative learning, Markov decision processes, Q-learning.

Text Books:

1. Data Mining–Concepts and Techniques -Jiawei Han and Micheline Kamber,MorganKaufmann (2nd Edition).
2. Machine Learning – Tom M. Mitchell, TMGH.
3. Introduction to Data Mining - Michael Steinbach, Pang-Ning Tan, and VipinKumar (Second Edition).
4. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012.
5. R. S. Sutton and A. G. Barto. Reinforcement Learning - An Introduction.MIT Press,1998.

References:

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning,Springer 2009.
2. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007.
3. Machine Learning Yearning, Andrew Ng.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
AUTOMATA AND COMPILER DESIGN

Course code: GR22A3115   **L/T/P/C: 2/1/0/3**
III Year II Semester

Prerequisites:
Students should have Knowledge in Data Structures, Simple graph algorithms,Programming language.

Course Outcomes:
1. Articulate the models for regular sets grammar for program constructs.
2. Develop the phases of the compiler for a language definition through regular expressionsand grammars.
3. Build the Bottom up parsers and intermediate code generation algorithms.
4. Experiment memory management techniques in the phases of compiler.
5. Interpret the Code optimization and code generation techniques.

UNIT I

Introduction: Alphabets, Strings and Languages; Automata and Grammars, Deterministic Finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic Finite Automata (NFA), introduction to CFG, Ambiguous grammar, Regular Expressions, Arden's theorem.

UNIT II

Compiler Structure: Compilers and Translators, Various Phases of Compiler, Pass Structure of Compiler, Bootstrapping of Compiler. **Lexical Analysis**: The role of Lexical Analyzer, The Lexical-Analyzer Generator Lex , **Syntax Analysis** : CFG, Lexical Versus Syntactic Analysis , Eliminating Ambiguity , Elimination of Left Recursion , Left Factoring, **Top-Down parsers**: Recursive-Descent Parsing, FIRST and FOLLOW, LL(1) Grammars, Non recursive Predictive Parsing, Error Recovery in Predictive Parsing.

UNIT III

Bottom–up Parsers: Reductions, Handle Pruning, Shift-Reduce Parsing, Conflicts During Shift- Reduce Parsing, LR parsers : SLR, Canonical LR, LALR, Parser Generators : YACC. Syntax Directed translationmechanism and attributed definition.

Intermediate Code Generation: Variants of Syntax Trees, Three-Address Code, Quadruples & Triples, Types and Declarations, Translation of Expressions, Type Checking, Control Flow, Switch- Statements, Intermediate Code for Procedures.

UNIT IV

Run Time Memory Management: Static and Dynamic storage allocation, stack based memory allocation schemes, Symbol Table management, Error Detection and Recovery: Lexical phase errors,Syntactic phase errors, Semantic errors.

UNIT V

Code Optimization and Code Generation: Local optimization, Loop optimization, Peephole optimization, Basic blocks and flow graphs, DAG, Data flow analyzer, Machine Model, Order of evaluation, Register allocation and code selection.

TEXT BOOKS

1. Introduction to Theory of Computation. Sipser, 2nd Edition,Thomson.
2. Hopcroft, Ullman, "Introduction to Automata Theory, Languages and Computation", PearsonEducation
3. Compilers Principles, Techniques and Tools Aho, Ullman, Sethi, PearsonEducation

REFERENCES

1. Modern Compiler Construction in C , Andrew W.Appel Cambridge University Press.
2. Compiler Construction, LOUDEN, Thomson.
3. Elements of Compiler Design, A. Meduna, Auerbach Publications, Taylor and Francis Group.
4. Principles of Compiler Design, V.Raghavan, TMH.
5. Engineering a Compiler, K. D. Cooper, L.Torczon, ELSEVIER.
6. Introduction to Formal Languages and Automata Theory and Computation -KamalaKrithivasan and RamaR, Pearson.
7. Modern Compiler Design, D. Grune and others,Wiley-India.
8. A Text book on Automata Theory, S. F. B. Nasir, P. K. Srimani, CambridgeUniv. Press.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
BIG DATA ANALYTICS

Course Code: GR22A3143   **L/T/P/C: 3/0/0/3**
 III Year II Semester

Pre - Requisites:

Students should have knowledge of one Programming Language (Java/ Python), thoroughpractice of SQL, and exposure to Linux/ UNIX Environment.

Course Outcomes:

1. Interpret the need for HDFS in processing big data.
2. Examine the purpose of data ingestion tools in Big Data Systems.
3. Implement distributed processing of big data using Map Reduce or Pig.
4. Compose Queries with Hive or HBase to analyze the data.
5. Inspect the components of Apache Spark to perform in memory processing.

UNIT - I

Introduction to Big Data and Hadoop

Types of Digital Data, Definition of Big Data, V's of Big Data, Advantages of Big Data, Characteristics of Hadoop, RDBMS Vs Hadoop, Ecosystem components of Hadoop, Big Data Analytics Pipeline, Hadoop Distributions, Need for HDFS, Characteristics of HDFS, HDFS Components, HDFS High Availability Architecture, Block Replication Method, Rack Awareness, HDFS Commands.

UNIT - II

Data Ingestion into Big Data Systems and ETL

Big Data Ingestion Tools, Apache Sqoop, Benefits of Apache Sqoop, Sqoop Connectors, Importing and Exporting to and from Hadoop using Sqoop, Limitations of Sqoop, Apache Flume Model, Data Sources for FLUME, Components of FLUME Architecture.

UNIT - III

Distributed Processing - Map Reduce and PIG

Need for YARN, Elements of YARN Architecture, Characteristics of Map Reduce, Phases of Map Reduce with an Example, Anatomy of MR Job Run with YARN, Handling Failures, Task Execution, Map Reduce Input and Output Formats, Shuffle and Sort, Joins in Map Reduce, Introduction to PIG, Components of PIG, Data Types in PIG – Simple and Complex, PIG Execution Modes, PIG Interactive Modes, Comparison of PIG with databases, Data Processing Operators.

UNIT - IV

Apache Hive and NOSQL Database - HBase

Features of HIVE, HIVE Architecture, HIVE Metastore, Datatypes in HIVE, HIVEQL, Tables, File Format Types–Text, Sequence, AVRO, Parquet, Querying Data, Types of NOSQL Database, Characteristics of HBASE, Architecture, HBase Vs RDBMS, HBASE Shell Commands.

UNIT - V

Apache Spark

Functional Programming, Components of Apache Spark, Applications of in - memory processing, Hadoop Ecosystem Vs. Spark, Spark Architecture, RDDs in Spark, SparkSQL, Architecture of SparkSQL, DataFrames, Data Analytics, Types of Analytics.

Text Books:

1.Tom White "Hadoop: The Definitive Guide"4thedition, O'reily Media, 2012.

2.Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.

References:

1. MichaelBerthold,DavidJ.Hand,"Intelligent DataAnalysis",Springer,2007.

2. Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRCpress(2013)

3. Tom Plunkett, Mark Hornick, "Using R to Unlock the Value of Big Data: Big DataAnalyticswithOracleREnterpriseandOracleRConnectorforHadoop", McGraw-Hill/Osborne Media(2013),Oracle press.

4. AnandRajaramanandJefreyDavidUlman,"MiningofMassiveDatasets",Cambridge UniversityPress,2012.

5. Bill Franks, "Taming the Big Data Tidal Wave:Finding Opportunities in HugeDataStreamswithAdvancedAnalytics",JohnWiley&sons,2012.

6. GlenJ.Myat,"MakingSenseofData",John Wiley&Sons,2007

7. PeteWarden,"BigDataGlossary",O'Reily,2011.

8. MichaelMineli,MicheleChambers,AmbigaDhiraj,"BigData,BigAnalytics:EmergingBusinessIntelligenceandAnalyticTrendsforToday'sBusinesses",WileyPublications,2013.

9. ArvindSathi,"BigDataAnalytics:DisruptiveTechnologiesforChangingtheGame",MCPress,2 012

10. Paul Zikopoulos ,Dirk DeRoos , Krishnan Parasuraman , Thomas Deutsch , JamesGiles,DavidCorigan,"HarnessthePowerofBigDataTheIBMBigDataPlatform",TataMc GrawHillPublications,2012.

GOKARAJU RANGARAJUINSTITUTE OF ENGINEERING AND TECHNOLOGY
SOFTWARE ENGINEERING
(Professional Elective- II)

Course Code: GR22A3052   **L/T/P/C: 3/0/0/3**
III Year II Semester

Course Outcomes:
1. Understand business requirements and choose a relevant Process model for a given software proposal
2. Analyze the requirements to prepare SRS.
3. Model various Architectural Designs for a software project.
4. Develop various functional and structural test cases for a software module
5. Estimate the Cost and Schedules of a Software Project.

UNIT I

Introduction to Software Engineering: The evolving role of software, Changing Nature of Software, Software myths.

A Generic view of process: Software engineering- A layered technology, a process framework, The Capability Maturity Model Integration (CMMI), Process patterns, process assessment, personal and team process models.

Process models: The waterfall model, Incremental process models, Evolutionary process models, The Unified process.

UNIT II

Software Requirements: Functional and non-functional requirements, User requirements, System requirements, Interface specification, the software requirements document.

Requirements engineering process: Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management.

UNIT III

Design Engineering: Design process and Design quality, Design concepts, the Design model. **Creating an architectural design:** Software architecture, Data design, Architectural Styles and Patterns, Architectural Design.

Performing User interface design: Golden rules, User interface analysis and design, interface analysis, interface design steps, Design evaluation.

UNIT IV

Testing Strategies: A strategic approach to software testing, test strategies for conventional software, Black-Box and White-Box testing, Validation testing, System testing, the art of Debugging.

Product metrics: Software Quality, Metrics for Analysis Model, Metrics for Design Model, Metricsfor source code, Metrics for testing, Metrics for maintenance.

Metrics for Process and Products: Software Measurement, Metrics for software quality.

UNIT V

Risk management: Reactive vs. Proactive Risk strategies, software risks, Risk identification, Risk projection, Risk refinement, RMMM, RMMM Plan.

Quality Management : Quality concepts, Software quality assurance, Software Reviews, Formal technical reviews, Statistical Software quality Assurance, Software reliability, The ISO 9000 quality standards.

TEXT BOOKS

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6thedition.McGrawHill International Edition.
2. Software Engineering- Sommerville, 7th edition, Pearson education.

REFERENCES

1. Software Engineering- K.K. Agarwal & Yogesh Singh, New Age International Publishers
2. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiely.
3. Systems Analysis and Design- Shely Cashman Rosenblatt,Thomson Publications.
4. Software Engineering principles and practice- Waman S Jawadekar, The McGraw-HillCompanies.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
MATHEMATICAL MODELING FOR DATA ANALYSIS
(PROFESSIONAL ELECTIVE-II)

Course Code: GR22A3144   **L/T/P/C:3/0/0/3**
III Year II Semester

Course Outcomes

1. Compute partial derivatives, directional derivative and gradient vectors. Understand the concept of multivariable calculus.
2. Gain knowledge on the theoretical aspects of optimization. Compute orthogonality of linear spaces.
3. Understand the properties of connectedness in directed and non-directed graphs
4. Gain knowledge on the concept algorithm and its complexity
5. Understand the properties of Vector spaces; Use the properties of Linear Maps in solving problems on Linear Algebra, Demonstrate proficiency on the topics Eigen values, Eigenvectors and Inner Product Spaces, Apply mathematics for some applications in Data Science.

UNIT I
CALCULUS OF SEVERAL VARIABLES
Functions of Several Variables - Limits and continuity in Higher Dimensions - Partial Derivatives - The Chain Rule - Directional Derivative and Gradient vectors - Tangent Planes and Differentials - Extreme Values and Saddle Points - Lagrange Multipliers.
INTRODUCTION TO VECTOR SPACES
Vector Spaces: Rn and Cn, lists, Fnand digression on Fields, Definition of Vector spaces, Subspaces, sums of Subspaces, Direct Sums, Span and Linear Independence, bases, dimension.

UNIT II
INTRODUCTION TO CONVEX OPTIMIZATION
Affine and Convex Sets - Hyper planes and half-spaces - Euclidean balls and ellipsoids - Normballs and Norm cones - polyhedral - simplex's - The positive definite cone.- separating and supporting hyper planes.
LINEAR MAPS
Definition of Linear Maps - Algebraic Operation son L(V,W) - Null spaces and Injectivity - Range and Surjectivity - Fundamental Theorems of Linear Maps - Representing a Linear Mapby a Matrix- Invertible Linear Maps- Isomorphic Vector spaces-Linear Maps Matrix Multiplication- Operators – Products of Vector Spaces- Product of Direct Sum-Quotients of Vector spaces.

UNIT III
NORMS AND INNER PRODUCT SPACES
Introduction - Inequalities on Linear Spaces - Norms on Linear Spaces - Inner products - Orthogonality - Unitary and Orthogonal Matrices - norms for matrices
EIGENVALUES, EIGENVECTORS, AND INNER PRODUCT SPACES
Eigen values and Eigenvectors - Eigenvectors and Upper Triangular matrices - Eigen spaces and Diagonal Matrices - Inner Products and Norms - Linear functional on Inner Product spaces.

UNIT IV
BASIC GRAPH THEORY
Graphs - subgraphs - factors - Paths - cycles - connectedness - trees - Euler tours - Hamiltoniancycles - Planar Graphs - Digraphs.

MATHEMATICS APPLIED TO DATA SCIENCE

Singular value decomposition - Handwritten digits and simple algorithm - Classification of handwritten digits using SVD bases - Tangent distance - Text Mining.

UNIT V

ALGORITHMS AND COMPLEXITY

Algorithms - Representing Graphs - The algorithm of Hierholzer - Writing algorithms -Complexity of Algorithms.

Text Books and Reference Books:

1. M. D. Weir, J. Hass, and G. B. Thomas, Thomas' calculus. Pearson,2016.
2. S. P. Boyd and L. Vanden Berghe, Convex optimization. Cambridge Univ. Pr., 2011.
3. D. Jungnickel, Graphs, networks and algorithms. Springer,2014.
4. J. Patterson and A. Gibson, Deep learning: a practitioner's approach. O'ReillyMedia,2011.
5. S. Sra, S. Nowozin, and S. J. Wright, Optimization for machine learning. MITPress,2012.
6. S. Axler, Linear algebra done right, Springer, 2017.
7. EldénLars, Matrix methods in datamining and pattern recognition, Society for Industrialand Applied Mathematics,2007.
8. E. Davis, Linear algebra and probability for computer science applications, CRCPress,2012.
9. J. V. Kepner and J. R. Gilbert, Graph algorithms in the language of linear algebra,Society for Industrial and AppliedMathematics,2011.
10. D.A.Simovici , Linear algebratoolsfordatamining,WorldScientificPublishing,2012.
11 P.N.Klein, Coding the matrix: linear algebra through applications to computer science,Newtonian Press,2015.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
CRYPTOGRAPHY AND NETWORK SECURITY
(PROFESSIONAL ELECTIVE-II)

Course Code:GR22A4048   **L/T/P/C: 3/0/0/3**
III Year II Semester

Pre-Requisites:
Students should have good knowledge in Computer Networks

Course Outcomes:
1. Summarize the security attacks, services and mechanisms.
2. Apply various public key and private key cryptographic algorithms for encryption anddecryption.
3. Articulate the issues and structure of Authentication Service and Electronic MailSecurity.
4. Interpret the IP Security Architecture, Web Security and Key Management techniques.
5. Analyze intrusion detection, Web security, firewalls.

UNIT I
Security Attacks (Interruption, Interception, Modification and Fabrication), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability) Security Mechanisms, a model for Internetwork security.

UNIT II
Conventional Encryption Principles, substitution ciphers, transposition ciphers. Conventional encryption algorithms (DES, Blowfish, Idea), cipher block modes of operation, location of encryption devices, key distribution.
Public key cryptography principles, public key cryptography algorithms (RSA, Diffie- Hellman, ECC), digital signatures, digital certificates, certificate authority and key management.

UNIT III
Approaches of Message Authentication, Secure Hash Functions (MD-5,SHA-1) and HMAC. Kerberos, X.509 Directory Authentication Service.
Email privacy: Pretty Good Privacy (PGP), MIME,S/MIME.

UNIT IV
IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management, Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET).

UNIT V
Basic concepts of SNMP, SNMPv1 Community facility and SNMPv3, Intruders, Viruses and related threats, firewall Design principles, Trusted System, Intrusion Detection Systems.

Case Studies on Cryptography and security: Secure Multiparty Calculation, Virtual Elections, Single sign On, Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability.

Text Books:

1. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education.
2. Hack Proofing your network by Ryan Russell, Dan Kaminsky, Rain Forest Puppy, Joe Grand, David Ahmad, Hal Flynn Ido Dubrawsky, Steve W.Manzuik and RyanPermeh, wiley Dreamtech

References:

1. Fundamentals of Network Security by Eric Maiwald (Dreamtech press)
2. Network Security - Private Communication in a Public World by Charlie Kaufman, Radia Perlman and Mike Speciner, Pearson/PHI.
3. Cryptography and network Security, Third edition, Stallings, PHI/Pearson
4. Principles of Information Security, Whitman, Thomson.
5. Network Security: The complete reference, Robert Bragg, MarkRhodes,TMH
6. Introduction to Cryptography, Buchmann, Springer.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
BLOCKCHAIN TECHNOLOGY
(PROFESSIONAL ELECTIVE –IV)

Course Code: GR22A3146 **L/T/P/C: 3/0/0/3**
III Year II Semester

Course Outcomes:

1. Summarize the fundamental concepts of Blockchain, Consensus mechanism and Cryptocurrency.
2. Illustrate the application of public blockchain system and smart contract in industry.
3. Comprehend the characteristics of private blockchain, consortium blockchain and Initial Coin Offering Platforms.
4. Demonstrate the security, privacy challenges and applications of blockchain
5. Develop blockchain programs using Python and Hyperledger Fabric for real time applications.

UNIT-I

Fundamentals of Blockchain: Introduction, Origin of Blockchain, Blockchain Solution, Components of Blockchain, Block in a Blockchain,The Technology and the Future.

Blockchain Types and Consensus Mechanism: Introduction, Decentralization and Distribution, Types of Blockchain, Consensus Protocol.

Cryptocurrency – Bitcoin, Altcoin and Token: Introduction, Bitcoin and the Cryptocurrency, Cryptocurrency Basics, Types of Cryptocurrencies, Cryptocurrency Usage.

UNIT-II

Public Blockchain System: Introduction, Public Blockchain, Popular Public Blockchains, The Bitcoin Blockchain, Ethereum Blockchain.

Smart Contracts: Introduction, Smart Contract, Characteristics of a Smart Contract, Types of Smart Contracts, Types of Oracles, Smart Contracts in Ethereum, Smart Contracts in Industry.

UNIT-III

Private Blockchain System: Introduction, Key Characteristics of Private Blockchain, Why We Need Private Blockchain, Private Blockchain Examples, Private Blockchain and Open Source, E-commerce Site Example, Various Commands (Instructions) in E-commerce Blockchain, Smart Contract in Private Environment, State Machine, Different Algorithms of Permissioned Blockchain, Byzantine Fault, Multichain.

Consortium Blockchain: Introduction, Key Characteristics of Consortium Blockchain, Why We Need Consortium Blockchain, Hyperledger Platform, Overview of Ripple, Overview of Corda.

Initial Coin Offering: Introduction, Blockchain Fundraising Methods, Launching an ICO, Investing in an ICO, Pros and Cons of Initial Coin Offering, Successful Initial Coin Offerings, Evolution of ICO, ICO Platforms.

UNIT-IV

Security in Blockchain: Introduction, Security Aspects in Bitcoin, Security and Privacy Challenges of Blockchain in General, Performance and Scalability, Identity Management and Authentication, Regulatory Compliance and Assurance, Safeguarding Blockchain Smart Contract (DApp), Security Aspects in Hyperledger Fabric.

Applications of Blockchain: Introduction, Blockchain in Banking and Finance, Blockchain in Education, Blockchain in Energy, Blockchain in Healthcare, Blockchain in Real-estate, Blockchain in Supply Chain, The Blockchain and IoT. Limitations and Challenges of Blockchain.

UNIT-V

Blockchain Case Studies: Case Study 1 – Retail, Case Study 2 – Banking and Financial Services, Case Study 3 – Healthcare, Case Study 4 – Energy and Utilities.

Blockchain Platform using Python: Introduction, Learn How to Use Python Online Editor, Basic Programming Using Python, Python Packages for Blockchain.

Blockchain platform using Hyperledger Fabric: Introduction, Components of Hyperledger Fabric Network, Chain codes from Developer.ibm.com, Blockchain Application Using Fabric Java SDK.

Text books:
1. "Blockchain Technology", Chandramouli Subramanian, Asha A.George, Abhilash K A and Meena Karthikeyan, Universities Press.

Reference books:
1. Blockchain Blueprint for Economy, Melanie Swan, SPD O'reilly.
2. Blockchain for Business, Jai Singh Arun, Jerry Cuomo, Nitin Gaur, Pearson Addition Wesley.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
MACHINE LEARNING LAB

Course Code: GR22A3142   **L/T/P/C: 0/0/3/1.5**
III Year II Semester

Prerequisites:
1. Mastery of introduction-level algebra, statistics, and probability theory
2. Proficiency in basic programming skills and coding experience in Python or R programming

Course Outcomes:
1. Illustrate the applications of python's machine learning libraries.
2. Apply dimensionality reduction techniques in machine learning applications.
3. Design and analyze various supervised learning mechanisms.
4. Develop back propagation and Random Forest algorithms.
5. Design and analyze various unsupervised learning algorithms.

Task 1
Write a python program to import and export data using Panda's library functions.

Task 2
Demonstrate various data preprocessing techniques for a given dataset.

Task 3
Implement dimensionality reduction using Principal Component Analysis (PCA) method

Task 4
Write a python program to demonstrate various Data Visualization Techniques.

Task 5
Implement Simple and Multiple Linear Regression models

Task 6
Develop Logistic Regression model for a given dataset

Task 7
Develop Decision Tree classification model for a given dataset and use it to classify a new sample.
Task 8
Implement Naïve Bayes Classification in Python for a given dataset.

Task 9
Build KNN Classification model in python for a given dataset.

Task 10
Implement Back propagation model in python for a given dataset.

TASK 11   **a)** Implement Random Forest classification method in python for a given
                  dataset.
             b) Implement Boosting ensemble method on a given dataset.

TASK 12
a)   Write a python program to implement K-Means clustering algorithm
b)   Write a python program to implement BIRCH algorithm

Reference Books:

1.   Python Machine Learning by Sebastian Raschka, Oreilly Publishers
2.   Machine Learning – Tom M. Mitchell, -MGH
3.   Data Mining–Concepts and Techniques -Jiawei Han and Micheline Kamber, MorganKaufmann
4.   Introduction to Data Mining - Michael Steinbach, Pang-Ning Tan, and Vipin Kumar(Second Edition).
5.   Christopher Bishop, Pattern Recognition and Machine Learning, Springer.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
BIG DATA ANALYTICS LAB

Course Code: GR22A3148   **L/T/P/C: 0/0/3/1.5**
III YEAR II Semester

Course Outcomes:

1. Understand Hadoop working environment.
2. Apply Map Reduce programs for real world problems.
3. Implement scripts using Pig to solve real world problems.
4. Analyze queries using Hive to analyze the datasets
5. Understand spark working environment and integration with R

TASK 1

Practice basic HDFS commands in Hadoop environment.

TASK 2

a) Ingest structured data using Apache Sqoop.
b) Ingest structured and unstructured data using Flume.

TASK 3

a) Write a word count program to simulate the Map Reduce Paradigm.
b) Write a Map Reduce program to perform matrix multiplication.

TASK 4

Implement a Map Reduce program to mine and analyze weather data set.

TASK 5

Write a Pig Latin script to sort, group, join, project, and filter the data.

TASK 6

a) Develop a pig Latin script to count the number of words in a text file.
b) Develop a pig Latin script to find maximum temperature across all the years using weather data set.

TASK 7

Create User Defined Functions/Eval functions in Pig to handle unwanted data during data processing.

TASK 8

Use Hive to create, alter, and drop databases, tables and views.

TASK 9

Practice User Defined functions and indexes using Hive.

TASK 10

Write HBase queries to handle databases.

TASK 11

Develop a program in Spark framework for processing of large datasets.

TASK 12

Practice on SparkSQL environment.

Text Books

1. Tom White, "Hadoop: The Definitive Guide", 4th Edition, O'Reilly Inc,2015.
2. Tanmay Deshpande, "Hadoop Real-World Solutions Cookbook", 2ndEdition, PacktPublishing, 2016.

Reference

1. Edward Capriolo, Dean Wampler, and Jason Rutherglen, "Programming Hive", O'ReillyInc, 2012.
2. Vignesh Prajapati, "Big data Analytics with R and Hadoop", Packt Publishing, 2013.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
MINI PROJECT WITH SEMINAR

Course Code: GR22A3089   **L/T/P/C: 0/0/4/2**
III Year II Semester

Course Outcomes:
At the end of this course, students will be able to:
1. Make use of fundamental knowledge and practical knowledge to implement towards industries.
2. Utilizing software and design, analyze the engineering Knowledge in accordance with applicable standards.
3. Analyze project management skills and scheduling of work in stipulated time.
4. Evaluate and demonstrate the problem finding ability in Engineering Technologies.
5. Develop technical information by means of written and oral reports.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
CONSTITUTION OF INDIA

CourseCode: GR22A2003   **L/T/P/C: 2/0/0/0**
III YEAR II semester

Course Outcomes:

1. Students will be able to know the importance of Constitution and Government

2. Students will be able to become Good Citizens and know their fundamental rights, duties and principles.

3. Students will learn about the role of PM, President, Council of Ministers etc and it will help studentslearn about Local Administration.

4. The students understand the importance of Election Commission and the Students will become aware of how a Country and State are run in Democracy.

5. They will know about Secularism, Federalism, Democracy, Liberty, Freedom of Expression, SpecialStatus of States etc.,

UNIT I
Introduction: Constitution' meaning of the term, Indian Constitution: Sources and constitutionalhistory, Features: Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy

UNIT II
Union Government and its Administration: Structure of the Indian Union: Federalism, Centre - State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha

UNIT III
State Government and its Administration: Governor: Role and Position, CM and Council of ministers, State Secretariat: Organization, Structure and Functions

UNIT IV
Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Pachayati raj: Introduction, PRI: Zila Pachayat, Elected officials and their roles, CEO Zila Pachayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials.

UNIT V
Composition of Judiciary and Election Commission: Composition of Indian Judiciary, Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC.

Books Recommended:

1. Indian Polity' by Laxmikanth 5th Edition, McGraw Hill Edition.

2. Indian Constitution by Subhash C. Kashyap, Vision Books Publisher

3. Introduction to Indian Constitution' by D.D. Basu, 21st Edition, LexisNexis Publisher

4. Indian Administration by Avasthi and Avasthi-by lakshminarainagarwal publication

IV YEAR
I SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
BUSINESS INTELLIGENCE

Course Code: GR22A4083   **L/T/P/C: 3/0/0/3**

IV Year I Semester

Course Outcomes:
1. Explain the fundamentals of business intelligence.
2. Link data mining with business intelligence.
3. Apply various modeling techniques.
4. Explain the data analysis and knowledge delivery stages.
5. Decide on appropriate technique.

UNIT I

Effective and timely decisions – Data, information and knowledge – Role of mathematicalmodels – Business intelligence architectures: Cycle of a business intelligence analysis – Enabling factors in business intelligence projects – Development of a business intelligencesystem – Ethics and business intelligence.

UNIT II

KNOWLEDGE DELIVERY - The business intelligence user types, Standard reports, Interactive Analysis and Ad Hoc Querying, Parameterized Reports and Self-Service Reporting, dimensional analysis, Alerts/Notifications, Visualization: Charts, Graphs, Widgets, Scorecards and Dashboards, Geographic Visualization, Integrated Analytics, Considerations: Optimizing the Presentationfor the Right Message.

UNIT III

EFFICIENCY MEASURES – The CCR model: Definition of target objectives- Peer groups – Identification of good operating practices; cross efficiency analysis – virtual inputs and outputs – Other models. Pattern matching – cluster analysis, outlier analysis.

UNIT IV

BUSINESS INTELLIGENCE APPLICATIONS - Marketing models – Logistic and Production models – Case studies.

UNIT V

FUTURE OF BUSINESS INTELLIGENCE   - Future of business intelligence – Emerging Technologies, Machine Learning, Predicting the Future, BI Search & Text Analytics – Advanced Visualization – Rich Report, Future beyondTechnology. Business Analytics Tools-COGNOS.

Text Books:
1. Business Intelligence: Data Mining and Optimization for Decision Making. By CarloVercellis, Wiley Publications, 1st,2009.
2. Business Intelligence: a New Paradigm by Vettor Claudio
3. Business Intelligence Road map: The complete project life cycle for decision support

Reference Books:

1. "Big Data in Practice: How 45 Successful Companies Used Big Data Analytics to Deliver Extraordinary Results", **Bernard Marr**

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ECONOMICS AND ACCOUNTING FOR ENGINEERS

Course Code: GR22A2004   **L/T/P/C: 3/0/0/3**
IV Year I Semester

Course Outcomes:

After studying this course, students will be in a position to:

1. The student will be able to understand the concepts of economics and Demand concepts,elasticity and techniques for forecast demand of products
2. The student will be able to plan the production levels in tune with maximum utilization oforganizational resources and with maximum profitability.
3. To understand the types of markets, types of competition and to estimate the cost of productsand decide the price of the products and services produced
4. The student will be able to analyze the profitability of various projects using capital budgeting techniques and
5. The student is able will be able prepare the financial statements and more emphasis onpreparation of final accounts.

UNIT-I

Introduction & Demand Analysis: Definition and Scope: Introduction to Economics, Nature and Scope of Managerial Economics. **Demand Analysis**: Demand Determinants, Law of Demand and its exceptions. **Elasticity of Demand**: Definition, Types, Measurement and Significance of Elasticity of Demand. **Demand Forecasting**, Factors governing demand forecasting, methods of demand forecasting.

UNIT-II

Production & Cost Analysis: Production Function – Isoquants and Isocosts, MRTS, Least Cost Combination of Inputs, Laws of Returns, Internal and External Economies of Scale. **Cost Analysis:** Cost concepts. Break-even Analysis (BEA)-Determination of Break-Even Point (simple problems) - Managerial Significance.

UNIT-III

Markets and Forms of Business organizations: Types of competition and Markets, Features of Perfect competition, Monopoly and Monopolistic Competition. **Pricing:** Objectives and Policies of Pricing. Methods of Pricing. **Business:** Features and evaluation of different formsof Business Organisation: Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types.

UNIT-IV

Capital Budgeting: Capital and its significance, Types of Capital, Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR) and Net Present Value (NPV) Method and Internal Rate of Return (IRR) (simple problems) and Profitability Index (PI)

UNIT-V

Introduction to Financial Accounting: Accounting Concepts and Conventions - Double-Entry Book Keeping. **Accounting Cycle:** Journal, Ledger, Trial Balance, Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments).

Text Books:

1. Aryasri: Managerial Economics and Financial Analysis, TMH, 2009.
2. Managerial Economics: Analysis, Problems and Cases - P. L. Mehta, Edition, 13. Publisher,Sultan Chand, 2007.
3. Financial Accounting -1: S P Jain and K. L. Narang, Kalyani Publishers,2005.

Reference Books

1. Peterson, Lewis and Jain: Managerial Economics, Pearson, 2009
2. Mithani : Managerial Economics , HPH, 2009
3. Lipsey&Chrystel, Economics, Oxford University Press, 2009
4. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi.2009
5. Horngren : Financial Accounting, Pearson, 2009.
6. Dr. S. N. Maheswari and Dr. S.K. Maheshwari: Financial Accounting, Vikas, 2009.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND   TECHNOLOGY
INTRODUCTION TO ROBOTICS
(Professional Elective -III)

Course code: GR22A4143   **L/T/P/C: 3/0/0/3**
IV Year I Semester

Prerequisites:

1. Student should be aware of Basic computer hardware
2. Student required Computer programming and basic hardware componentsassembly.

Course Outcomes:
On completion of the course the student will be able to:
1. List and explain the basic elements of industrial robots
2. Analyse robot kinematics and its control methods.
3. Classify the various sensors used in robots for better performance.
4. Summarize various industrial and non-industrial applications of robots.
5. Design a Robot using advanced machine learning algorithm

UNIT-I
Robot Basics Robot-Basic Concepts, Need, Law, History, Anatomy, Specifications. Robot Configurations-Cartesian, Cylinder, Polar And Articulate. Robot Wrist Mechanism, Precision And Accuracy Of Robot.
Robot Elements End Effectors-Classification, Types Of Mechanical Actuation, Gripper Design, Robot Drive System Types, Position And Velocity Feedback Devices-Robot Joints And Links-Types, Motion Interpolation.

UNIT II
Robot Kinematics And Control Robot Kinematics – Basics Of Direct And Inverse Kinematics, Robot Trajectories, 2D And 3D Transformation-Scaling, Rotation, Translation Homogeneous Transformation.

Control Of Robot Manipulators – Point To Point, Continuous Path Control, Robot Programming, Control – Pwm, Joint Motion Control, Feedback Control, Computed Torque Control

UNIT III
Robot Sensors Sensors In Robot – Touch Sensors-Tactile Sensor – Proximity And Range Sensors. Force Sensor-Light Sensors, Pressure Sensors, Introduction To Machine Vision And Artificial Intelligence.
Actuators (Electrical)- Dc Motors, Bldc Servo Motors, Sensors , Sensor Integration

UNIT IV
Robot Applications - Industrial Applications of Robots, Medical, Household, Entertainment, Space, Underwater, Defense, Disaster Management. Applications, Micro And Nanorobots, Future Applications.

UNIT V
Probabilistic Robotics, Path Planning, Bfs; Dfs; Dijkstra; A-Star; D-Star; Voronoi; Potential Field; Hybrid Approaches
Simultaneous Localization And Mapping, Introduction To Reinforcement Learning

Text Books:
1. Robert J Schilling, Fundamentals of Robotics, Prentice Hall India, 200
2. John J Craig, Introduction to Robotics, Prentice Hall International, 2005

3. Groover, Mitchell Weiss, Roger N Nagel,Industrial Robotics Technology,Programming and Applications, Tata –McGraw Hill Pub, 2008.
4. Deb.S.R and Sankha Deb,Robotics Technology and Flexible Automation, TataMcGraw Hill Pub, 2010.
5. Klafter.R.D, Chmielewski.T.A, and Noggin's, Robot Engineering: An IntegratedApproach, Prentice Hall, 1994.
6. Fu.K.S, Gonzalez, Robotics control, sensing, vision and intelligence, Tata- McGrawHill Pub, 2008.
7. Yu. Industrial Robotics, MIR Publishers Moscow, 1985.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
NEURAL NETWORKS AND DEEP LEARNING

Course Code:GR22A3118   **L/T/P/C: 3/0/0/3**
IV Year I Semester

Prerequisites:
The subject of Neural Networks & Deep Learning requires strong mathematical concepts of probability, statistics, matrices and a course on Artificial Intelligence is expected to be completed by the student.

Course Outcomes:
1. Summarize the working of basic ANN models and Supervised Learning Models
2. Apply different unsupervised learning networks that can be used to solve a problem.
3. Compare the working of ANN models and Deep learning models in selecting a network for solution.
4. Evaluate Parameter Regularization Procedure in Deep Neural network.
5. Design various Deep learning optimization algorithms for real-time applications.

UNIT I
Artificial Neural Networks - Introduction, Basic models of ANN, important terminologies, Supervised Learning Networks, Perceptron Networks, Adaptive Linear Neuron, Back-propagation Network. Associative Memory Networks. BAM and Hopfield Networks.

UNIT II
Unsupervised Learning Network- Introduction, Fixed Weight Competitive Nets, Maxnet, Hamming Network, Kohonen Self-Organizing Feature Maps, Learning Vector Quantization, Counter Propagation Networks, Adaptive Resonance Theory Networks. Special Networks-Introduction to various networks
.

UNIT III
Introduction to Deep Learning: Historical Trends in Deep learning, Deep Feed - forward networks, Gradient- Based learning, Hidden Units, Architecture Design, Back- Propagation and Other Differentiation Algorithms, Transfer learning.

UNIT IV
Regularization for Deep Learning: Parameter norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised learning, Multi-task learning, Early Stopping, Parameter Typing and Parameter Sharing, Sparse Representations

UNIT V
Optimization for Train Deep Models: Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates.
Applications: Large-Scale Deep Learning, Computer Vision, Image classification, Speech Recognition, Natural Language Processing, GANS

Text Books

1. Deep Learning –Ian Good fellow, Yoshua Bengio, Aaron Courville — MIT Pressbook- ISBN-13: 978-0262035613,
2. Neural Networks a Comprehensive Foundations, Simon Haykin, PHI edition.

References

1. Artificial Neural Networks – B. Vegnanarayana Prentice Hall of India P Ltd2005
2. Neural Networks in Computer Intelligence, Li Mm Fu TMH2003
3. Deep Learning Fundamentals: An Introduction for Beginners by Chao Pan , AI Sciences Publisher.
4. Pattern Recognition and Machine Learning - Christopher M. Bishop -Information Science and Statistics.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
NATURAL LANGUAGE PROCESSING
(Professional Elective –III)

Course Code: GR22A4079   **L/T/P/C: 3/0/0/3**
IV Year I Semester

Prerequisites:
Students are expected to have knowledge in Formal Languages and Automata Theory,Compiler Design.

Course Outcomes:
1. Summarize the role of natural language processing in various applications and explain language modelling.
2. Analyze information retrieval systems and utilize lexical resources for processing naturallanguage text.
3. Apply word level analysis and syntactic analysis on natural language processing.
4. Demonstrate semantic analysis on natural language processing and Discuss discourse processingof text.
5. Illustrate the automation of natural language generation and machine translation of Indian languages.

UNIT I
Overview: Origins and challenges of NLP, Language and Grammar, Processing IndianLanguages, NLP Applications, Information Retrieval.
Language Modeling: Introduction, Various Grammar-based Language Models, StatisticalLanguage Model.

UNIT II
Information Retrieval: Introduction, Design features of Information Retrieval Systems,Classical, Non-classical, Alternative Models of Information Retrieval, Evaluation
Lexical Resources: Introduction, WordNet, Frame Net, Stemmers, POS Tagger, ResearchCorpora.

UNIT III
Word Level Analysis: Introduction, Regular Expressions, Finite State Automata, Morphological Parsing, Spelling Error Detection and correction, Words and Word classes, Part of SpeechTagging,TF, IDF.

Syntactic Analysis: Introduction, Context-free Grammar, Constituency, Parsing,Probabilistic Parsing.

UNIT IV
Semantic Analysis: Introduction, Meaning Representation, Lexical Semantics, Ambiguity,Word Sense Disambiguation.
Discourse Processing: Introduction, Cohesion, Reference Resolution, Discourse CoherenceandStructure

UNIT V
Natural Language Generation: Introduction, Architecture of NLG Systems, GenerationTasks and Representations, Application of NLG.
Machine Translation: Introduction, Problems in Machine Translation, Characteristics of Indian Languages, Machine Translation Approaches, Translation involving Indian Languages.

Textbooks:

1. Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval",Oxford University Press, 2008.

References:

1. Daniel Jurafsky and James H Martin, "Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition",Prentice Hall, 2nd Edition,2008.
2. James Allen, Bejamin/cummings, "Natural Language Understanding", 2ndedition,1995.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
SEMANTIC WEB
(PROFESSIONAL ELECTIVE-III)

Course Code: GR22A4084

IV Year-I Semester   **L/T/P/C: 3/0/0/3**

Course Outcomes:

1. Identify and debate on various description languages in semantic web.
2. Analyze vocabulary, properties and characteristics to annotate the requirements of semantic web languages.
3. Apply ontology methods and tools to represent knowledge in the form of ontology.
4. Predict human behavior in social web and related communities in visualizing social networks.

UNIT I

The Future of the Internet: Introduction, The Syntactic web, The Semantic Web, Ontology in Computer Science: Defining the term Ontology, Taxonomies versus Ontologies, Thesauri versus Ontologies, Classifying Ontologies, Web Ontology Description Languages, Ontologies, Categories and Intelligence, Knowledge Representation in Description Language: Introduction, The family of Attributive languages, Inference Problems.

UNIT II

RDF and RDF Schema: Introduction, XML Essentials, RDF, RDF Schema, Summary of the RDF/RDF Schema Vocabulary, OWL: Introduction, Requirements for Web Ontology Description Languages, Header Information, Versioning and Annotation Properties, Data type and Object Properties, Property Characteristics, Classes, Individuals, Summary of the OWL Vocabulary.

UNIT III

Rule Languages: Introduction, Usage Scenarios for Rule Languages, Semantic Web Services: Web Service Essentials, OWL-S Service Ontology, Methods for Ontology Development, Ontology Sources: Metadata, Upper Ontologies, Semantic Web and Software Tools: Metadata and Ontology Editors.

UNIT IV

Introduction to the Semantic Web and Social Networks: Limitations of the Semantic Web, Development of the Semantic Web, The Emergence of the Social Web, Social Network Analysis: What is social network Analysis, Development of Social Network Analysis, Key Concepts and Measures in Network Analysis.

UNIT V

Electronic Sources for Network Analysis: Electronic Discussion Networks, Blogs and online Communities, Web based Networks, Building Semantic Web Applications with Social Network Features.

Text Books/ Reference Books

1. Semantic Web: Concepts, Techniques and Applications – Karin K. Breitman, Marco Antonio Casanova, Walter Truszkowski, Springer,2007.
2. Social Networks and the Semantic Web – Peter Mika, Springer,2007.
3. Semantic Web Technologies ,Trends and Research in Ontology Based Systems,J.Davies,Rudi Studer,PaulWarren,JohnWiley&Sons.
4. Semantic Web and Semantic Web Services -Liyang LuChapman and Hall/CRCPublishers,(Taylor & FrancisGroup).

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
INFORMATION STORAGE AND MANAGEMENT
(PROFESSIONAL ELECTIVE –IV)

Course Code: GR22A4052   **L/T/P/C: 3/0/0/3**
IV Year I Semester

 Course Outcomes:
1. Summarize the components of storage infrastructure.
2. Analyze the storage architectures including storage subsystems.
3. Develop the methods for business continuity, backup and recovery.
4. Integrate the concepts of storage security and information security applied to virtualmachine.
5. Apply the storage infrastructure for cloud computing and its techniques.

UNIT I
INTRODUCTION TO INFORMATION STORAGE MANAGEMENT
Virtualization and Cloud Computing: Fiber Channel: Overview, Business Continuity,Back Up Recovery: Business Continuity: Information Availability, Storage Security and Management: Cloud Computing: Cloud Enabling Technologies
Evolution of Storage Architecture: SAN and its Evolution BC Terminology, BC Planning life cycle, Information Security Framework, Characteristics of Cloud Computing

UNIT II
DATA CENTRE INFRASTRUCTURE
Components of FC SAN, FC Connectivity, FC Architecture, Failure Analysis, Business Impact Analysis, Risk Triad, Benefits of Cloud Computing.
Virtualization and Cloud Computing: IPSAN-iSCSI components, BC TechnologySolutions, Storage Security Domains, Cloud Service Models, Key challenges in managing information: iSCSI Protocol Stack iSCSI Names, Backup and Archive: Backup Purpose, Security Implementations in Storage Networking, Cloud Deployment models

UNIT III
DATA CENTER ENVIRONMENT AND NAS
Data Center Environment: Application, NAS: General Purpose Servers versus NAS Devices, Backup Considerations, Securing Storage Infrastructure in Virtualized and Cloud

Environments, Cloud Infrastructure Mechanism: Logical Network Perimeter
Network Attached Storage (NAS): Benefits of NAS- File Systems and Network File Sharing Backup Granularity, Recovery considerations, RSA and VMware Security Products, Virtual Server, Cloud Storage Device

UNIT IV
HOST AND INTELLIGENT STORAGE SYSTEM
Host: Connectivity, Storage Components of NAS Backup Methods, Backup Architecture, Monitoring the Storage Infrastructure, Cloud Usage Monitor, Disk Drive Components, Disk Drive Performance, NAS I/O Operation, Backup and Restore Operations, Monitoring Parameters, Resource Replication

Intelligent Storage System: NAS Implementations, Backup Topologies, Components Monitored, Monitoring examples, Ready Made environment, Components of an Intelligent Storage System, NAS File Sharing Protocols Backup in NAS Environments Storage Infrastructure Management Activities Container

UNIT V
STORAGE PROVISIONING AND VIRTUAL STORAGE MACHINE
Storage Provisioning: Object Based Storage Devices, Backup Targets, Data Deduplication for Backup Storage Infrastructure Management Challenges, Storage Management Examples CloudChallenges, Types of Intelligent Storage Systems, Content Addressed Storage, Backup in Virtualized Environments, Storage Allocation to a New Server/Host, Cloud Adoption Considerations
Virtual Storage Machine: Creation of Virtual storage machine, Configuration and Tracing of FC scan, Sharing Files between host and Virtual, Creation of a Linux Instance in Public, Usage of Cloud services with open source, Navigation of storage system, iSCSI scan Machines, Usage of Backup techniques, Cloud, Generate a private key, Access using SSH client, cloud tools (likeEucalyptus, Open stack, Open Nebula and others)

Text Books

1. EMC Education Services, "Information Storage and Management", 2nd edition WileyIndia, ISBN-13:978-1118094839

2. Thomas Erl, "Cloud Computing: Concepts, Technology & Architecture", PrenticeHall, 2013,ISBN:9780133387568

References

1. Ulf Troppens, Rainer, Wolfgang, Muller,"Storage Networks Explained", India,Wiley, 2010, ISBN-13: 978-0470741436

2. Matthew Portnoy, "Virtualization Essentials", ISBN-13: 978-1119267720, Sybex;2 edition

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
PRINCIPLES OF PROGRAMMING LANGUAGES
(PROFESSIONAL ELECTIVE – IV)

Course Code: GR22A3047   **L/T/P/C: 3/0/0/3**
IV Year I Semester

Course Outcomes:
1. Evaluate language constructs and programming paradigms.
2. Apply formal methods of syntax, semantics and data types.
3. Illustrate sub programs, blocks and control structures in different programming languages.
4. Construct abstract data types, concurrency and exceptions.
5. Compare functional and imperative languages.

UNIT I
Preliminary Concepts: Reasons for studying, concepts of programming languages, Programming domains, Language Evaluation Criteria, Influences on Language design, Language categories, Programming Paradigms – Imperative, Object Oriented, Functional Programming , Logic Programming.
Programming Language Implementation: Compilation and Virtual Machines, Programming environments.

UNIT II
Syntax and Semantics: General Problem of describing Syntax and Semantics, formal methods of describing syntax - BNF, EBNF for common programming language features, parse trees, ambiguous grammars, attribute grammars, denotation semantics and axiomatic semantics for common programming language features.
Data types: Introduction, primitive, character, user defined, array, associative, record, union, pointer and reference types, design and implementation uses related to these types, Names, Variable,concept of binding, type checking, strong typing, type compatibility, named constants and variableinitialization.

UNIT III
Expressions and Statements: Arithmetic relational and Boolean expressions, Short circuit evaluation, mixed mode assignment, Assignment Statements, Control Structures– Statement Level, Compound Statements, Selection, Iteration, Unconditional Statements, guarded commands.
Subprograms and Blocks: Fundamentals of sub-programs, Scope and lifetime of variable, static and dynamic scope, Design issues of subprograms and operations, local referencing environments, parameter passing methods, overloaded sub-programs, generic sub-programs, parameters that are sub- program names, design issues for functions, user defined overloaded operators, co routines.

UNIT IV
Abstract Data types: Abstractions and encapsulation, Introduction to data abstraction, design issues, language examples, C++ parameterized ADT, object oriented programming in C++, Java, C#,Python
Concurrency: Subprogram level concurrency, semaphores, monitors, message passing, Java threads, Examples: Java RMI, Parallel Java, Parallel C

Exception handling: Exceptions, Exception propagation, Exception handler in C++ and Java and PHP. Handling Large Database.

UNIT V

Functional Programming Languages: Introduction, fundamentals of FPL, LISP, ML, Haskell, application of Functional Programming Languages and comparison of functional and imperative languages.

Logic Programming Language: Introduction and overview of logic programming, basic elements of prolog, application of logic programming.

Text Books:
1. Concepts of Programming Languages Robert .W. Sebesta 6/e, Pearson Education.
2. Programming Languages –Louden, Second Edition,Thomson.

References:
1. Programming languages –Ghezzi, 3/e, JohnWiley
2. Programming Languages Design and Implementation – Pratt and Zelkowitz, Fourth Edition PHI/Pearson Education

GOKARAJU RANGARAJUINSTITUTE OF ENGINEERING AND TECHNOLOGY
DESIGN PATTERNS
(PROFESSIONAL ELECTIVE – IV)

Course Code: GR22A4063   **L/T/P/C: 3/0/0/3**
IV Year I Semester

Prerequisites:
Knowledge on oops and UML concepts.

Course Outcomes:

1. Ability to analyze and apply different design patterns for real life scenarios.
2. Ability to solve Object oriented design problems with a case study of designing a Document Editor.
3. Illustrates the skill apply creational design patterns.
4. Demonstrates the ability to apply different structural design patterns.
5. Analyze and Apply different behavioral design patterns.

UNIT I

Introduction: What Is a Design Pattern?, Design Patterns in Smalltalk MVC, Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns solve Design Problems, How to Select a Design Pattern, How to Use a Design Pattern.

UNIT II

A Case Study: Designing a Document Editor: Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation, Summary.

UNIT III

Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns.
Structural Pattern Part-I: Adapter, Bridge, Composite.

UNIT IV

Structural Pattern Part-II: Decorator, Façade, Flyweight, Proxy.
Behavioral Patterns Part-I: Chain of Responsibility, Command, Interpreter, Iterator.

UNIT V

Behavioral Patterns Part-II: Mediator, Memento, Observer, State, Strategy, Template Method Visitor, Discussion of Behavioral Patterns. What to Expect from Design Patterns, A Brief History, The Pattern Community An Invitation, A Parting Thought.

TEXTBOOKS:

1. Design Patterns by Erich Gamma, Pearson Education.

REFERENCES:

1. Pattern's in JAVA Vol-I by Mark Grand,Wiley DreamTech.
2. Pattern's in JAVA Vol-II by Mark Grand,Wiley DreamTech.
3. JAVA Enterprise Design Patterns Vol-III by Mark Grand,Wiley DreamTech.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
SOFTWARE PROJECT MANAGEMENT

Course Code: GR22A4126   **L/T/P/C: 3/0/0/3**
IV YEAR I SEMESTER

Course Outcomes: After going through this course, the student will be able to

1. Develop the model from the conventional software product to the modern
2. Analyze and design the software architecture.
3. Design various estimation levels of cost and effort
4. Acquire the knowledge of managing, economics for conventional, modern and future software projects
5. Sketch various artifacts sets for better understanding of software development

UNIT I
Conventional Software Management: The waterfall model, conventional software Management performance.
Evolution of Software Economics: Software Economics, pragmatic software cost estimation.
Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.

UNIT II
Life cycle phases: Engineering and production stages, inception, Elaboration, Construction, transition phases.
Artifacts of the process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.
Model based software architectures: A Management perspective and technical perspective.
Work Flows of the process: Software process workflows, Iteration workflows.

UNIT III
Checkpoints of the process: Major mile stones, Minor Milestones, Periodic status assessments.
Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.

UNIT IV
Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.
Process Automation: Automation Building blocks, The Project Environment.

UNIT V
Project Control and Process instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.

TEXT BOOKS:

1. Software Project Management, Walker Royce: Pearson Education.

REFERENCES:

1. Software Project Management, Bob Hughes and Mike Cotterell: Tata McGraw- Hill Edition.
2. Software Project Management, Joel Henry, Pearson Education.
3. Software Project Management in practice, Pankaj Jalote, Pearson Education.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
BUSINESS INTELLIGENCE LAB

Course Code:GR22A4086   **L/T/P/C: 0/0/4/2**

IV Year I Semester

Course Outcomes:
1. Identify the major frameworks of computerized decision support: decision support systems(DSS), data analytics and business intelligence(BI).
2. Explain the foundations, definitions, and capabilities of DSS, data analytic and BI.
3. Demonstrate the impact of business reporting, information visualization, and dashboards.
4. Explain data mining, neural networks, support vector machines, text analytics, text mining,sentiment analysis, web mining, web analytics, social analytics, social network analysis.
5. Apply big data technologies in business intelligence using geospatial data, location basedanalytics, social networking, Web 2.0, reality mining, and cloud computing

TASK 1
Import the legacy data from different sources such as (Excel, SqlServer, Oracle etc.) and loadin the target system. (You can download sample database such as Adventureworks, Northwind, foodmart etc.)

TASK 2
Perform the Extraction Transformation and Loading (ETL) process to construct the databaseIn the Sqlserver.

TASK 3
Create the cube with suitable dimension and fact tables based on ROLAP, MOLAP andHOLAP model.

TASK 4
Create the ETL map and setup the schedule for execution.

TASK 5
Execute the MDX queries to extract the data from the data warehouse.

TASK 6
Import the data warehouse data in Microsoft Excel and create the Pivot table and Pivot Chart Import the cube in Microsoft Excel and create the Pivot table and Pivot Chart to perform dataanalysis.

TASK 7
Apply the what – if Analysis for data visualization. Design and generate necessary reportsbased on the data warehouse data.

TASK 8
Perform the data classification using classification algorithm.

TASK 9
Perform the data clustering using clustering algorithm

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TASK 10
Perform the Linear regression on the given data warehouse data.

TASK 11

Perform the logistic regression on the given data warehouse data.

Text Books:

1. Business Intelligence and Analytics: Systems for Decision Support, 10th edition, byRamesh Sharda, Dursun Delen, and Efraim Turban. Upper Saddle River, NJ: Pearson Education,2014.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
VISUAL PROGRAMMING USING C# AND .NET LAB

Course Code: GR22A2080   **L/T/P/C: 0/0/4/2**
IV Year I Semester

Course Outcomes:
1. Create Event Driven Applications.
2. Develop asynchronous applications
3. Deploy Web services
4. Build database applications using ADO.NET
5. Understand the Language Integrated Query (Linq) library

TASK 1

Write a program to check weather a given number is palindrome using C#

TASK 2

Create a program to implement a concept of Overloading using C#.Net.

TASK 3

Write a program to store the employee details using class and methods in C# .NET

TASK 4

Create a program to implement the concepts of OOPS for creating class, inheritance

TASK 5

Create a Window Form using HTML Controls

TASK 6

Perform String Manipulation with the String Builder and String Classes and C#: Demonstrates some basic string manipulation using both the String Builder and Stringclasses.

TASK 7

Demonstrate the concept of
a) Creating a Thread
b) Managing a Thread
c) Deleting a Thread

TASK 8

Create a Sample program to Demonstrate Insertion of data intodatabase.

TASK 9

Create a Program to Demonstrate ColorDialog in C#.

TASK 10

Create a program to perform validation using validation controls.

TASK 11

Create a Sample program to Demonstrate creation and usage of Dynamic Link Libraries in C#.

TASK 12

Student Management System application development with required details: Use ADO.NET for storing and manipulating the data. Develop the necessary forms for the better user interface.

Text Books:

1. Professional C# 5.0 and .NET 4.5.1, Christian Nagel, Jay Glynn and Morgan Skinner, John Wiley & Sons Inc.
2. Beginning ASP.net 4.5.1 in C# and VB, Imar Spaanjaars, Wrox Publication, 2014.

References:

1. Microsoft Visual C# Step by Step, John Sharp, O'Reilly Media, Inc., 2013.
2. A Tester's Guide to .NET Programming, Randal Root and Mary Romero Sweeney, Apress

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PROJECT WORK - PHASE I

Course Code: GR22A4082   **L/T/P/C: 0/0/12/6**

IV Year I Semester

Course Outcomes:

At the end of this course, students will be able to:

1. Practice and acquire the knowledge within the chosen area of technology for Project Development.
2. Identify, discuss, and justify the technical aspects of the chosen project with a comprehensive and systematic approach.
3. Design and develop Engineering Projects by implementing technical aspects.
4. Work as an individual or in a team in development of Technical Projects.
5. Compile and report effectively the project related activities and findings.

IV YEAR
II SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
FUNDAMENTALS OF MANAGEMENT AND ENTREPRENEURSHIP

Course code:GR22A3116   **L/T/P/C:3/0/0/3**
IV Year II Semester

Course Outcome:

1. The students understand the significance of Management in their Profession.
2. The various Management Functions like Planning, Organizing, Staffing, Leading,Motivation and Control aspects are learnt in this course.
3. The students can explore the Management Practices in their domain area and understand,adopt motivational theories and leadership styles and apply controlling techniques at right time for better decision making.
4. The student will be exposed to the basic concepts of entrepreneurship and its developmentprocess.
5. The student will be able to evaluate business ideas and attain hands on experience in designing value proposition and he will acquire the ability of developing a business plan /model.

UNIT I
Introduction to Management: Definition, Nature and Scope, Functions, Managerial Roles, Levels of Management, Managerial Skills; Evolution of Management Thought- Classical Approach- Scientificand Administrative Management; The Behavioural approach; The Systems Approach; Contingency Approach.

UNIT II
Planning and Organizing: Planning – Planning Process, Types of Plans, Decision making and Steps in Decision Making; Principles of Organization: Span of control, organizational Design & Organizational Structures; Departmentalization, Delegation; Centralization, Decentralization.

UNIT III
Leading, Motivation and Controlling: Leadership, Power and Authority, Leadership Styles; Behavioral Leadership, Situational Leadership, Leadership Skills. Motivation – Types; MotivationalTheories – Needs Hierarchy Theory, Two Factor Theory, Theory X and Theory Y. - controlling– basic control process– control techniques.

UNIT IV
Nature of Entrepreneurship: Characteristics and skillsof an entrepreneur, Entrepreneur scenario in India and abroad. Types of entrepreneur, types of ownership, Small business in Indian economy. RiskReduction strategies. Strategies for growth. Financial aspects: sources 128 of rising capital, schemes of Department of Industries (DIC), KVIC, SIDBI, NABARD, NSIC, IFCI and IDBI.

UNIT V
Creating and Starting the venture: Creativity and the business idea (Self-discovery, Opportunity discovery); Developing the business plan (Business model –Lean canvas by Alexander Osterwalder); Marketing plan (Customer & Solution- Value proposition, Marketing & Sales); Financial plan (Validation, money), Human Resource Plan (Team).

TEXTBOOKS:
1. Management Fundamentals, Robert N Lussier, 5e, Cengage Learning, 2013.
2. Fundamentals of Management, Stephen P. Robbins, Pearson Education, 2009.
3. Principles and Practice of Management, L. M. Prasad, Sultan Chand & Sons, 2012
4. Entrepreneurship- Robert D Hisrich, Michael P Peters, Dean A Shepherd, TMH.2009

REFERENCES:
1. Essentials of Management, Koontz Kleihrich, Tata Mc – Graw Hill.
2. Management Essentials, Andrew DuBrin, 9e, Cengage Learning, 2012.
3. Entrepreneurship- Rajeev Roy, Oxford, 2011
4. Intellectual Property- Deborah E.Bouchoux,Cengage, 20

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
REAL TIME OPERATING SYSTEMS
(PROFESSIONAL ELECTIVE –V)

Course Code: GR22A4120   **L/T/P/C:3/0/0/3**
IV Year II Semester

Course Outcomes:
1. Summarize the concepts of Operating system Principles, System Calls and Files.
2. Analyze the network topology and network communication process used in distributedoperating systems.
3. Implement the Real-time operating system languages and models.
4. Paraphrase the RTOS Kernel Principles and design patterns for inter task synchronizationand communication.
5. Articulate the emerging trends and applications in Real-time systems.

UNIT I
Review of Operating Systems: Basic Principles, system calls, Files-Processes, design and implementation of processes, Communication between processes, operating system structures.

UNIT II
Distributed Operating Systems: Topology, Network Types, Communication, RPC, Client servermodel, Distributed file systems and design strategies.

UNIT III
Real Time Models and Languages: Event based, Process based, Graph models, Petrinet models, Real- time Languages, RTOS tasks, RTscheduling, Interrupt processing, Synchronization, Controlblocks, Memory requirements.

UNIT IV
Implementation of RTOS in ESP32, Inter-Task Communication in the Spark Fun ESP32 thing with Free RTOS.
Real-Time System Design Patterns: Patterns for task synchronization and communication, Patterns for fault tolerance and error handling in real-time systems, Patterns for handling resource conflicts and priority inversion, Patterns for adapting to changing system conditions

UNIT V
Emerging Trends in Real-Time Systems: Cyber-Physical Systems (CPS) and IoT integration, Edge and fog computing, Machine learning and AI in real-time applications, Security and safety challenges in real-time systems, Industry trends and future directions in real-time system design, Implementation and analysis of real-time systems using an RTOS, Performance evaluation and optimization of real-time tasks, Design and simulation of real-time communication protocols, Modeling and analysis of a real-time system using formal methods.

Text Books:
1. Charles Crowley "operating systems , A design oriented approach" McGraw Hill
2. Tenenbum, "Distributed Operating Systems"PHI,1999

References:

1. CM Krishna,Kang G. Shin, "Real time Systems", McGrawHill,1997
2. Raymond J.A., Donald L Baily, "An introduction to real time operating systems" PHI,1999.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
CYBER FORENSICS
(PROFESSIONAL ELECTIVE –V)

Course code: GR22A4130   **L/T/P/C: 3/0/0/3**
IV Year II Semester

Prerequisites:
1. Student should be aware of Information Security concepts
2. Student required Computer programming and Information science

Course Outcomes:
1. Discuss the security issues network layer and transport layer.
2. Apply security principles in the application layer.
3. Students are able to use forensic tools.
4. Students analyze and validate forensics data.
5. Analyze acquisition methods for digital evidence related to system security.

UNIT- I
Introduction of Cybercrime: Types, The Internet spawns crime, Worms versus viruses, Computers' roles in crimes, Introduction to digital forensics, Introduction to Incident - **Incident Response Methodology** – Steps - Activities in Initial Response, Phase after detection of an incident.

UNIT-II
Initial Response and forensic duplication, Initial Response & Volatile Data Collection from Windows system -Initial Response & Volatile Data Collection from Unix system – **Forensic Duplication:** Forensic Duplicates as Admissible Evidence, Forensic Duplication Tool Requirements, Creating a Forensic. Duplicate/Qualified Forensic Duplicate of a Hard Drive

UNIT - III
Forensics analysis and validation: Determining what data to collect and analyze, validating forensic data, addressing data-hiding techniques, performing remote acquisitions
Network Forensics: Network forensics overview, performing live acquisitions, developing standard procedures for network forensics, using network tools, examining the honeynet project.

UNIT -IV
Current Forensic tools: evaluating computer forensic tool needs, computer forensics software tools, computer forensics hardware tools, validating and testing forensics software E-Mail Investigations: Exploring the role of e-mail in investigation, exploring the roles of the client and server in e-mail, investigating e-mail crimes and violations, understanding e-mail

servers, using specialized e-mail forensic tools.
Cell phone and mobile device forensics: Understanding mobile device forensics, understanding acquisition procedures for cell phones and mobile devices.

UNIT- V

Working with Windows and DOS Systems: understanding file systems, exploring Microsoft File Structures, Examining NTFS disks, Understanding whole disk encryption, windows registry, Microsoft startup tasks, MS-DOS startup tasks, virtual machines.

TEXT BOOKS:

1. **Cybersecurity & Digital Forensics by ANAS ZAKIR – 17 March 2022.**
2. Kevin Mandia, Chris Prosise, "Incident Response and computer forensics", Tata McGraw Hill.
3. Man Young Rhee, "Internet Security: Cryptographic Principles", "Algorithms and Protocols", Wiley Publications.

REFERENCE BOOKS:

1. John R.Vacca, "Computer Forensics", Cengage Learning.
2. Richard E.Smith, "Internet Cryptography", 3rd Edition Pearson Education.
3. Marjie T.Britz, "Computer Forensics and Cyber Crime": An Introduction", 3rd Edition, Prentice Hall.
4. Cyber Forensics A Complete Guide - 2020 Edition Kindle Edition by Gerardus   Blokdyk (Author).
5. Cyber Forensics Examining Emerging and Hybrid Technologies Edited by Albert J. Marcella.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
GREEN COMPUTING
(Professional Elective –V)

Course Code: GR224121   **L/T/P/C:3/0/0/3**
IV Year II Semester

Course Outcomes:
1. Summarize the fundamentals of green computing practices.
2. Apply the modeling to reduce negative impact on the environment.
3. Analyze the energy saving practices for use in hardware.
4. Demonstrate the tools for reducing paper waste and carbon foot print.
5. Articulate green computing strategies for Case Study Scenarios.

UNIT I
Fundamentals: Green IT Fundamentals: Business, IT, and the Environment – Green computing: carbon footprint, scoop on power – Green IT Strategies: Drivers, Dimensions, and Goals – Environmentally Responsible Business: Policies, Practices, and Metrics.

UNIT II
Green Assets and Modeling: Green Assets: Buildings, Data Centers, Networks, and Devices – Green Business Process Management: Modeling, Optimization, and Collaboration – Green Enterprise Architecture –Environmental Intelligence – Green Supply Chains – Green Information Systems: Design and Development Models.

UNIT III
Grid Framework: Virtualizing of IT systems – Role of electric utilities, Telecommuting, teleconferencing and teleporting – Materials recycling – Best ways for Green PC – Green Data center Green Grid framework.

UNIT IV
Green Compliance: Socio-cultural aspects of Green IT – Green Enterprise Transformation Roadmap Green Compliance: Protocols, Standards, and Audits – Emergent Carbon Issues: Technologies and Future.

UNIT V
Case Studies: The Environmentally Responsible Business Strategies (ERBS) – Case Study Scenarios for Trial Runs – Case Studies – Applying Green IT Strategies and Applications to a Home, Hospital, Packaging Industry and Telecom Sector.

TEXT BOOKS:
1. Bhuvan Unhelkar**, "**Green IT Strategies and Applications-Using Environmental Intelligence",CRC Press, June 2011
2. Woody Leonhard, Katherrine Murray, "Green Home computing for dummies", August 2009.

REFERENCES:

1. Alin Gales, Michael Schaefer, Mike Ebbers, "Green Data Center: steps for the Journey", Shoff/IBM rebook, 2011.

2. John Lamb, "The Greening of IT", Pearson Education, 2009.

3. Jason Harris, "Green Computing and Green IT- Best Practices on regulations &industry",Lulu.com, 2008.

4. Carl speshocky, "Empowering Green Initiatives with IT", John Wiley & Sons, 2010.

5. Wu Chun Feng (editor), "Green computing: Large Scale energy efficiency", CRC Press, 2012.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ROBOTIC PROCESS AUTOMATION
(PROFESSIONAL ELECTIVE-V)

Course Code: GR22A4146   **L/T/P/C:3/0/0/3**
IV Year II Semester

Course Outcomes:

1. Understand Robotic Process Automation Concepts.
2. Apply UiPath programming techniques to deploy robot configurations
3. Explore various data extraction techniques and perform integrations with various popular applications.
4. Design and develop a programmed robot that includes logging and exception handling
5. Deploy and control Bots with UiPath Orchestrator.

UNIT I

Introduction: What is Robotic Process Automation (RPA), Scope & techniques of Automation, Benefits of RPA, Components of RPA, RPA Platforms, UiPath Studio, Installation of UiPath Studio, Learning UiPath Studio.

UNIT II

Sequence, Flowchart & Control Flow: Sequencing the Workflow, Activities, Flowchart, Control Flow for Decision making. Data Manipulation: Variables, Collection, Arguments, Data Table, Clipboard management, File operations With effect from the Academic Year 2019-20 32 Controls: Finding the control, waiting for a control, Act on a control, UiExplorer, Handling Events Recording and advanced UI Interaction Basic recording, Desktop recording, Web recording, Citrix, Screen Scraping, When to use OCR, Types of OCR available, How to use OCR Avoiding typical failure points.

UNIT III

Plugins and Extensions: Terminal plugin, Java plugin, Java plugin with UiPath Studio, Citrix automation, Citrix environment, Mail plugin, PDF plugin, Web integration, Excel and Word plugins, Credential management Extensions Handling User Events and Assistant Bots: What are assistant bots, Monitoring system event triggers: Hotkey trigger, Mouse trigger, System trigger, Monitoring image and element triggers, Launching an assistant bot on a keyboard event.

UNIT IV

Exception Handling, Debugging, and Logging: Exception handling, Common exceptions and ways to handle them, Logging and taking screenshots Debugging techniques, Setting break points, Slow step, Highlighting, Break, Collecting crash dumps: Enabling crash dumps, Disabling crash dumps, Error reporting: Enterprise Edition customers, Community Edition users. Managing and Maintaining the Code: Project organization, Picking an appropriate layout for each workflow, Breaking the process into smaller parts, Using exception handling, Making your workflow readable, Keeping it clean, Nesting workflows, Reusability of workflows, Templates, Commenting techniques, State Machine, When to use Flowcharts State Machines or Sequences.

UNIT V

Deploying and Maintaining the Bot: Publishing using publish utility, Overview of Orchestration Server, Using Orchestration Server to control bots, Using Orchestration Server to deploy bots, License management, Activating and uploading a license to Orchestrator, Publishing and managing updates, Packages, Managing packages

Text Books:

1. Alok Mani Tripathi, Learning Robotic Process Automation, Publisher: OReilly Publishing, 2018, ISBN:9781788470940
2. Frank Casale (Author), Rebecca Dilla (Author), Heidi Jaynes (Author), Lauren Livingston (Author), Introduction to Robotic Process Automation: a Primer, Institute of Robotic Process Automation, Amazon Asia-Pacific Holdings Private Limited,2018

Reference Books:

1. Richard Murdoch, Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant, Amazon Asia-Pacific Holdings Private Limited, 2018.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
SOFTWARE TESTING METHODOLOGIES
(PROFESSIONAL ELECTIVE-VI)

Course Code: GR22A4058   **L/T/P/C: 3/0/0/3**
IV Year II Semester

Prerequisites:
1. Students should have finish a course on Software Engineering.
2. Basic Knowledge about Software Testing.

Course Outcomes:
1. Identify the various bugs and correcting them after knowing the consequences of the bug.
2. Apply Path testing Strategies to conduct as part of White Box Testing.
3. Apply various Data flow testing techniques for exploring Data Bugs and Domain Bugs.
4. Design test cases based on decision tables for a given logical construct.
5. Understand graph matrices and apply matrices techniques for the simplification of graphs and simplify testing process.

UNIT - I
Introduction: Purpose of testing, Dichotomies, Model for testing, Consequences of bugs, Taxonomy of Bugs.

UNIT - II
Flow Graphs and Path Testing: Basics concepts of Path Testing, Predicates, Path Predicates and Achievable Paths, Path Sensitizing, Path Instrumentation, Application of Path Testing.
Transaction Flow Testing: Transaction flows, transaction flow testing techniques.

UNIT - III
Dataflow testing: Basics of dataflow testing, strategies in dataflow testing, application of dataflow testing.
Domain Testing: Domains and paths, Nice & ugly domains, Domain Testing, domains and interfaces testing, domain and interface testing, domains and testability.

UNIT - IV
Paths, Path products and Regular expressions: Path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection.
Logic Based Testing: Overview, decision tables, path expressions, kv charts, specifications.

UNIT - V
State, State Graphs and Transition testing: State graphs, good & bad state graphs, state testing, Testability tips.
Graph Matrices and Application: Motivational overview, matrix of graph, relations, power of a matrix, Node Reduction algorithm.

TEXT BOOKS:
1. Software Testing techniques – Boris Beizer, Dreamtech, 2nd Edition.
2. Software Testing Tools – Dr.K.V.K.K.Prasad, Dreamtech.

REFERENCE BOOKS:
1. The craft of software testing - Brian Marick, Pearson Education.
2. Software Testing Techniques –SPD(Oreille).
3. Software Testing in the Real World – Edward Kit, Pearson.
4. Effective methods of Software Testing, Perry, John Wiley.
5. Art of Software Testing – Meyers, John Wiley.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
IMAGE AND VIDEO PROCESSING
(PROFESSIONAL ELECTIVE –VI)

Course Code: GR22A4051   **L/T/P/C:3/0/0/3**
IV Year II Semester

Pre requisites:
Analysis of algorithms and linear algebra.
Programming experience.

Course Outcomes:
1. Summarize the basic principles of image processing and transformations.
2. Organize the image enhancement and segmentation methods.
3. Apply image compression techniques on images.
4. Outline the basic steps of video processing.
5. Implement the 2-D motion Estimation techniques.

UNIT I
Fundamentals of Image Processing and Image Transforms: Basic steps of Image Processing System Sampling and Quantization of an image, Basic relationship between pixels.

UNIT II
Image Enhancement: Spatial domain methods: Histogram processing, Fundamentals of Spatial filtering, Smoothing spatial filters, Sharpening spatial filters. Frequency domain methods: Basics of filtering in frequency domain, Image smoothing, Image sharpening, Selective filtering.
Image Segmentation: Segmentation concepts, Point, Line and Edge Detection, Thresholding, Region based segmentation.

UNIT III
Image Compression: Image compression fundamentals - Coding Redundancy, Spatial and Temporal redundancy, Compression models: Lossy& Lossless, Huffman coding, Bit plane coding, Transform coding, Predictive coding, Wavelet coding, Lossy Predictive coding, JPEG Standards.

UNIT IV
Basic Steps of Video Processing: Analog Video, Digital Video. Time-Varying Image Formation models: Three Dimensional Motion Models, Geometric Image Formation, Photometric Image Formation, Sampling of Video signals, filtering operations.

UNIT V
Motion Estimation: Optical flow, General Methodologies, Pixel Based Motion Estimation, Block-Matching Algorithm, Mesh based Motion Estimation, Global Motion Estimation, Region based Motion Estimation, Application of motion estimation in Video coding.

Text Books:
1. Digital Image Processing – Gonzalez and Woods, 3rd Ed., Pearson.
2. Video Processing and Communication – Yao Wang, Joem Oysterman and Ya–quinZhang. 1st Ed., PHInt.

References:
1. Digital Image Processing and Analysis-Human and Computer Vision Application withCVIP Tools – Scotte Umbaugh, 2nd Ed, CRCPress,2011.
2. Digital Video Processing – M. Tekalp, Prentice Hall International
3. Digital Image Processing with MATLAB and Lab view – VipulaSingh,Elsevier
4. Video Demystified – A Hand Book for the Digital Engineer – Keith Jack, 5thEd.,Elsevier

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
NETWORK ROUTING ALGORITHMS
(PROFESSIONAL ELECTIVE –VI)

Course Code: GR22A4050   **L/T/P/C: 3/0/0/3**
IV Year II Semester

Course Outcomes:
1. Acquire knowledge on network devices where and when they are used.
2. Comprehend various types of subnets and address formats.
3. Examine different dimensions of routing in different types of networks
4. Analyze different types of data delivery methods.
5. Apply various routing protocols in wireless network scenario

UNIT I
NETWORK ROUTING BASICS: Reference model OSI, TCP/IP, ATM. Network devices: Hubs, repeaters, switches, bridges, routers and gateways. Types of switches, bridges and routers. Router: Input processing, switching, output processing. Control plane versus data plane. Frame formats: IEEE 802.3, 802.11 and 802.15. Software defined network (SDN): SDN architecture, SDN advantages.

UNIT II
IP ADDRESSING: The Internet Protocol (IP): Classful and classless addressing, Subnets and super netting, VLSM and FLSM. IPv4 and IPv6 address formats. Transitions from IPV4 to IPV6. Forwarding and Addressing in the Internet, Datagram Format, Internet Control MessageProtocols: ICMP, IGMP. ARP and DHCP.

UNIT III
ROUTING ALGORITHMS: The Link-State (LS) Routing Algorithm, The Distance-Vector (DV) Routing Algorithm, Hierarchical Routing. Routing in the Internet: Intra-AS Routing in the Internet: RIP,Intra-AS Routing in the Internet: OSPF. Inter-AS Routing: BGP, Broadcast and Multicast Routing Broadcast Routing Algorithms. Intra-domain Multicast Protocols, Inter- domainMulticast Protocols.

UNIT IV
ROUTING PROTOCOLS: VPNs, Tunnelling and Overlay Networks: Virtual Private Networks(VPNs), Multiprotocol Label Switching (MPLS), Overlay Networks –VoIP and Multimedia Networking: Overview of IP Telephony, VoIP Signalling Protocols, Real-TimeMedia Transport Protocols, Stream Control Transmission Protocol. Internet Protocol- Connectionless Datagram Delivery- Forwarding IP Datagrams-Congestion control in data networks and internets

UNIT V
ROUTING IN AD-HOC NETWORKS: Mobile Ad-Hoc Networks (MANETS):
Classification of routing protocols, The table-driven or proactive protocols are: i). The Destination-Sequenced Distance Vector (DSDV) protocol, ii). The Cluster-Head Gateway Switch Routing (CGSR) protocol, iii).The Wireless Routing Protocol (WRP). The source- initiated protocols are: i). The Dynamic Source Routing (DSR) protocol, ii). The Associative- Based Routing (ABR) protocol, iii). The Temporally Ordered Routing Algorithm (TORA), iv).Ad-Hoc On-Demand Distance Vector (AODV) protocol.

Text Books:
1. Computer networking A Top Down Approach sixth edition, James F kurose & Keith WRoss
2. Computer and Communication networks, Nader F. Mir, Pearson Education, 2007

Reference Books:
1. Data communications and Networking, Behrouz Z. Forouzan, FourthEdition, Tata McGraw Hill, 2007
2. Guide to Networking Essentials, Greg Tomsho, Ed Title, David Johnson,Fifth Edition, Thomson.
3. An Engineering Approach to Computer Networking, S. Keshav, Pearson Education.
4. Campus Network design Fundamentals, Diane Teare, Catherine Paquet, Pearson Education(CISCO Press)
5. Computer Networks, Andrew S. Tanenbaum, Fourth Edition, Prentice Hall.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
SOFTWARE PRODUCT DEVELOPMENT AND MANAGEMENT
(PROFESSIONAL ELECTIVE –VI)

Course Code: GR22A4125   **L/T/P/C: 3/0/0/3**
IV Year II Semester

Course Outcomes:

1. Interpret the foundation of Software Product Development Methodology and planning.
2. Create the product architecture, design, and define the testing approach.
3. Analyze the product qualification and release the software with prior testing and training.
4. Summarize the framework for management control as well as legal and managementcompliance for marketing and selling the software.
5. Illustrate the software product maintenance, service and support throughout the product lifecycle.

UNIT I
FOUNDATION AND PLANNING: INTRODUCTION AND FOUNDATION:
Three Vital Aspects of Software Project Management - Introduction to Software Product Development Methodology -Software Process Models -Roles - Responsibilities.
PRODUCT PLANNING: Project Planning: Top-Down and Bottom-Up Planning - Types of Activity - Project Duration: Schedule Monitoring Tools - Gantt Chart, PERT Chart,Critical Path.

UNIT II
PRODUCT DEVELOPMENT: Initiation -Architecture and Design -Product Specifications - Defining the Final Product - Data Flow Diagram, Data Dictionary
Testing Approach-Software Testing: Test Plan - Development Testing: Verification and Validation - General Testing Methods: White Box and Black Box Testing - Unit Testing – System Integration Testing - Validation Testing - System testing.

UNIT III
PRODUCT RELEASE: Software Quality - Quality Measures - FURPS - Software Quality Assurance
- Software Reviews - Format Technical Review (FTR) Formal Approaches to SQA –Compliance withthe design and coding standards. Alpha Release/Product Qualification -Beta Release -Product Training Planning.

UNIT IV
Project Management and Control: Framework for Management and control – Collection of data – Visualizing progress – Cost monitoring – Earned Value Analysis – Prioritizing Monitoring – Project tracking – Change control
PRODUCT SALES AND MARKETING: Product Sales and Marketing Approach -Product Legal and Compliance Management -Product Market Rollout.

UNIT V
MAINTENANCE SERVICES AND SUPPORT: Software as an evolutionary entity, need for maintenance, categories of maintenance, Software Version Control, Software Re- Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, Product Support -Product Governance -Monitoring and Control Through-Out Entire Product Lifecycle, Case study.

TEXT BOOKS:

1. Dan Conde, Software Product Management: Managing Software Development from Idea to Product to Marketing to Sales, Aspatore Books; 1st edition
2. Alyssa Dver , Software Product Management Essentials, Meghan KifferPr

REFERENCES:

1. GerardusBlokdyk, Software Product Development A Complete Guide, 5starcooks
2. Allan M. Anderson, Product Development and Management Body of Knowledge: A Guidebook for Training and Certification, CreateSpace Independent Publishing Platform
3. https://en.wikipedia.org/wiki/Software_development

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
PROJECT WORK - PHASE II

Course Code: GR22A4145   **L/T/P/C: 0/0/12/6**
IV Year II Semester

Course Outcomes:

At the end of this course, students will be able to:
1. Practice and acquire the knowledge within the chosen area of technology for Project Development.
2. Identify, discuss, and justify the technical aspects of the chosen project with a comprehensive and systematic approach.
3. Design and develop Engineering Projects by implementing technical aspects.
4. Work as an individual or in a team in development of Technical Projects.
5. Compile and report effectively the project related activities and findings.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
SOFT SKILLS AND INTERPERSONAL SKILLS
(OPEN ELECTIVE)

Course Code: GR22A3145   **L/T/P/C:3/0/0/3**

Course Outcomes:
- Develop soft skills communication skills, leadership skills etc.
- Implement goal setting techniques to build a promising career and evaluate the power of confidence building and self-esteem with examples.
- Design formal report and proposals with appropriate formal expressions.
- Create healthy workplace environment by treating others with respect and dignity.
- Describe team dynamics and exchange ideas about the elements of positive teamwork.

Unit 1: Soft Skills
➢ Introduction to soft skills, Definition of Soft skills, Importance of soft skills
➢ Communication skills, Usage of English in Business/Corporate scenario
➢ Nonverbal communication - Proxemics
➢ Presentation skills

Unit 2: Team Building & Leadership Qualities
➢ Qualities of a good leader
➢ Problem solving and Decision Making
➢ Strategic management
➢ Crisis management

Unit 3: Personality Development
➢ Motivation
➢ Goal setting
➢ Self-esteem
➢ Team skills

Unit 4: Developing Reports and Proposals
➢ Understanding reports and proposals
➢ Planning reports and proposals
➢ Writing beginning, body and ending
➢ Formats of reports and proposals

Unit 5: Interpersonal Skills
➢ Understanding professional relationships
➢ Networking professionally
➢ Showing basic office courtesies
➢ Interview skills

Text Books:
1.Soft Skills-Key to success in workplace and life Meenakshi Raman, Raman Upadhyay, CENAGE

Reference Books:
1. Soft skills for Everyone - Jeff Butterfield, CENAGE Learning
2. Soft skills for Interpersonal Communication - S.Balasubramaniam (ORIENT BLACKSWAN)

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
HUMAN RESOURCE DEVELOPMENT AND ORGANIZATIONAL BEHAVIOUR
(OPEN ELECTIVE)

Course Code: GR22A4049   **L/T/P/C: 3/0/0/3**

Course Outcomes
1. To acquaint the student with the determinants of intra -individual, inter-personnel and inter-group behaviour in organizational setting.
2. To Understand individual behavior in organizations, including diversity, attitudes, job satisfaction, emotions, moods, personality, values, perception, decision making, and motivational theories and apply in the organizational context.
3. To assess the group behavior in organizations, including communication, leadership, power and politics, conflict, and negotiations in the framework of organization and to familiarize the concepts, techniques and practices of human resource development in the current organizational view.
4. To impart and apprise the capable of applying the principles and techniques as professionals for developing human resources in an organization.
5. To report the current trends and applications in HRD and Balanced Scorecard to measures the performance and to develop, implement, and evaluate organizational human resource development strategies aimed at promoting organizational effectiveness in different organizational environments.

Unit I - Introduction to OB : Organizational Behaviour- Concept and Emergence of OB Concept; Nature and Theoretical frameworks; Models of Organizational Behaviour, Challenges and Opportunities for Organizational Behavior;

Unit II- Individual Behaviour: Individual Behaviour: Personality, Learning, Values and Attitudes, Perception, Stress at work. Management's assumptions about people- McGregor's Theory X and Theory Y. Motivation - Maslow's Need Hierarchy, Herzberg's Two Factors Theory, Vroom's Expectancy Theory.

Unit III-Inter-personal and Group Behaviour: Interpersonal communication and Feedback; Transactional Analysis (TA); Johari Window. Group Behaviour: Group Dynamics, Cohesiveness and Productivity; Management of Dysfunctional groups; Group Decision Making. Leadership- Concept and Styles.

Unit IV -Introduction to Human Resource Development: Concept; Relationship between human resource management and human resource development; HRD mechanisms, processes and outcomes; HRD matrix; Roles and competencies of HRD professionals; Challenges in HRD, steps in HRD Process.

Unit V-HRD Applications and Trends: Coaching and mentoring; Career management and development; Competency mapping; Balanced Score Card. HRD in Organizations: Selected cases covering HRD practices in government Organizations, manufacturing and service industries and MNCs.

Text Books:
1. Robbins, Stephen P. and Timothy A. Judge, Organizational Behaviour, Prentice -Hall, New Delhi.
2. Werner J. M., DeSimone, R.L., Human resource development, South Western.

Reference Books:
1. Luthans, Fred, Organizational Behaviour, McGraw-Hill, New York.
2. Gregory, Moorhead and Ricky W. Griffin, Managing Organizational Behaviour, Thomson South Western Publication.
3. Pareek, Udai and V. Sisodia, "HRD in the New Millennium, Tata McGraw - Hill Publishing Co. Ltd., New Delhi, 1999.
4. Haldar, U. K., Human resource development, Oxford University Press India.
5. Rao, T.V., Future of HRD, Macmillan Publishers India.
6. Rao, T.V., HRD Score Card 2500: Based on HRD audit, Response Books, SAGE Publications.
7. Mankin, D., Human resource development, Oxford University Press India.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
CYBER LAW AND ETHICS
OPEN ELECTIVE

Course Code: GR22A4077   **L/T/P/C: 3/0/0/3**

Course Outcomes

1. Students identify and analyze statutory, regulatory, constitutional, and organizational laws that affect the information technology professional.
2. Students locate and apply case law and common law to current legal dilemmas in the technology field.
3. Students apply diverse viewpoints to ethical dilemmas in the information technology field and recommend appropriate actions.
4. Students will be able understand cybercrime and ethical practices and the student will be able to know and learn web technologies and related issues.
5. The student will be in position to interface with various issues pertaining to Intellectual Property, copy rights, patents rights etc. and provide an overview of cybercrime and framework.

Unit I - The Legal System: Sources of Law and The Court Structure: Enacted law -Acts of Parliament are of primary legislation, Common Law or Case law- Principles taken from decisions of judges constitute binding legal rules. The Court System in India and Foreign Courtiers. (District Court, District Consumer Forum, Tribunals, High Courts, Supreme Court), Arbitration: As an alternative to resolving disputes in the normal courts, parties who are in dispute can agree that this will instead be referred to arbitration.

Unit II - Introduction cyber law: Computers and its Impact in Society, Overview of Computer and Web Technology, Need for Cyber Law, Cyber Jurisprudence at International and Indian Level. , NITI Aayog and some current aspects.

Unit –III - Constitutional & Human Rights Issues in Cyber space : Freedom of Speech and Expression in Cyberspace, Right to Access Cyberspace, Access to Internet, Right to Privacy, Right to Data Protection.

Unit –IV Cyber Crimes & Legal Framework: Cyber Crimes against Individuals, Institution and State, Hacking, Digital Forgery, Cyber Stalking/Harassment, Cyber Pornography, Identity Theft & Fraud, Cyber terrorism, Cyber Defamation, Different offences under IT Act

Unit –V Intellectual Property Issues in Cyber Space: Interface with Copyright Law, Interface with Patent Law, Trademarks & Domain Names Related issues.

Text Books:

1. Chris Reed & John Angel, Computer Law, OUP, New York, (2007).
2. Justice Yatindra Singh, Cyber Laws, Universal Law Publishing Co, New Delhi, (2012)
3. Verma S, K, Mittal Raman, Legal Dimensions of Cyber Space, Indian Law Institute, New Delhi, (2004)
4. Jonthan Rosenoer, Cyber Law, Springer, New York, (1997).
5. Sudhir Naib, The Information Technology Act, 2005: A Handbook.
6. S. R. Bhansali, Information Technology Act, 2000
7. University Book House Pvt. Ltd. Jaipur (2003).
8. Vasu Deva, Cyber Crimes and Law Enforcement, Commonwealth Publishers, New Delhi

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ECONOMIC POLICIES IN INDIA
OPEN ELECTIVE

Course Code: GR22A4147   **L/T/P/C: 3/0/0/3**

Course Outcomes:

1. Familiarize with the nature of business environment and its components.
2. The students will be able to demonstrate and develop conceptual framework of business environment.
3. Understand the definition of ethics and the importance and role of ethical behaviour in the business world today.
4. Explain the effects of government policy on the economic environment.
5. Outline how an entity operates in a business environment.

Unit 1: Business environment-factors effecting Business Environment-need for industrial policies, Overview of Indian Economy, Trends towards market economy, problems of underdevelopment – meaning, Main problems, reasons, of underdevelopment.

Unit :2 Factors and measure, Meaning of Economic development, National income, Per capital income, Quality of life, Capital Formation – Savings, Investment.

Unit 3: NITI Aayog and Planning in India, Niti Aayog and its function, how is Niti Aayog different from planning commission, Meaning, Importance, Main reasons of adopting, planning in India, Objectives of planning, Economic development, moderation, stability, self-sufficiency, employment etc, foreign aid, Employment. Allocation of Resources,

Unit 4: Private and Public Sector, Public Sector – role and growth, Achievements of the public sector, Private Sector – Importance Problems, New foreign Trade Policy.

Unit 5: Present Economic Policy, Main feature, Globalization, Expansion of Private sector, more market orient approach. Public distribution system, Industrial policies before and after 1991, Industrial Licensing, Monetary and Fiscal Policy, elements of Indian current GDP and review of current budget.

Text Books:
1. Francis Cherunilam: Business Environment: Text and Cases. 18/e. Himalaya. 2009.
2. Misra and Puri: Indian Economy, Himalaya, 2009.

Reference Books:
1. Indian Economy- A. N. Agarwal
2. Indian Economy – Mishra &Puri
3. Indian Development and planning – M. L. Jhingan
4. Indian Economy – R. S. Rastogi Yozna and Kurukshetra Magazines

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DATA SCIENCE FOR ENGINEERS
OPEN ELECTIVE

Course Code: GR22A3049   **L/T/P/C:3/0/0/3**

Course Outcomes:
1. Illustrate a flow process for data science problems.
2. Demonstrate the mathematical foundations for data science.
3. Analyze the data science process and predictive modelling.
4. Develop R codes for data science solutions.
5. Correlate results to the solution approach followed.

UNIT I
Introduction to R, Variables and datatypes in R, Data frames, Recasting and joining of dataframes, Recasting and joining of dataframes, Arithmetic, Logical and Matrix operations in R, Advanced programming in R : Functions, Control structures, Data visualization in R Basic graphics.

UNIT II
Linear Algebra and Statistics for Data Science: Solving Linear Equations, Linear Algebra Distance, Hyperplanes and Halfspaces, Eigenvalues, Eigenvectors, Statistical Modelling, Random Variables and Probability Mass/Density Functions, Sample Statistics.

UNIT III
Introduction to Data Science, Solving Data Analysis Problems - A Guided Thought Process, Predictive Modelling, Linear Regression, Model Assessment, Diagnostics to Improve Linear Model Fit.

UNIT IV
Simple Linear Regression Model Building, Cross Validation, Multiple Linear Regression Modelling Building and Selection.

UNIT V:
Classification, K - Nearest Neighbors (KNN), K - Nearest Neighbors implementation in R, K - means Clustering, K - means implementation in R.

Text Books:
1. Data Science for Engineers, 1st Edition, Raghunathan Rengaswamy, Resmi Suresh, CRC Press, Taylor & Francis Group.
2. Introduction to Linear Algebra, Fifth Edition, Gilbert Strang, ISBN: 978-09802327-7-6.
3. Applied Statistics and Probability for Engineers, Douglas Montgomery, George C Runger, Fifth Edition, John Wiley & Sons, Inc.

Reference Books:
1. Hands On Introduction To Data Science Hardcover – 2 April 2020 by Chirag Shah (Author)
2. Essential Math for Data Science: Take Control of Your Data with Fundamental Linear Algebra, Probability, and Statistics by Thomas Nield (Author)

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DATA ANALYTICS USING OPEN SOURCE TOOLS
OPEN ELECTIVE

Course Code: GR22A3120   **L/T/P/C: 3/0/0/3**

Course Outcomes:
1. Interpret about graphics techniques in data analysis.
2. Implement data modeling techniques for a dataset.
3. Develop the simulation for mining and clustering the data.
4. Infer the data using business intelligence and predictive analytics
5. Implement the data analytics using Programming Environments

UNIT I
Graphics: A Single Variable – Dot and Jitter Plots, Histograms and Kernel Density Estimates, The Cumulative Distribution Function, Rank-Order Plots and Lift Charts, Summary Statistics and Box Plots, Practice using Numpy, Two Variables- Scatter Plots, Smoothing, Logarithmic Plots, Banking, Practice using Matplotlib, Time As A Variable- Time-Series Analysis, More Than Two Variables- False-color plots, Multiplots.

UNIT II
Modeling Data: Guesstimation and the back of the envelope- Principles, Perturbation Theory and Error Propagation, Models from scaling arguments- Models, Arguments from Scale, Mean-Field Approximations, Common Time-Evolution Scenarios, Arguments from probability models- The Binomial Distribution and Bernoulli Trials, The Gaussian Distribution and the Central Limit Theorem, Power-Law Distributions and Non-Normal Statistics, Bayesian Statistics.

UNIT III
Mining Data: Simulations- Monte Carlo Simulations, Resampling Methods, Discrete Euent Simulations with *SimPy*, Finding Clusters- Distance and Similarity Measures, Clustering Methods, Pre and Postprocessing, *Pycluster,* Seeing the Forest for the trees- PCA, Kohonen Maps, PCA with R.

UNIT IV
Applications: Reporting, Business intelligence and Dashboards- Corporate Metrics and Dashboards, Data Quality Issues, Financial calculations and modeling- The Time Value of Money ,Uncertainty in Planning and Opportunity Costs, Cost Concepts and Depreciation, Predictive analytics- algorithms for classification.

UNIT V
Programming Environments and Data analytics
Programming Environments: Software Tools, A Catalog of Scientific Software - Matlab, R, Python
Results from Calculus: Common Functions, Calculus, Useful Tricks -Binomial theorem, Linear transformation.
Working with data: Sources for Data, Cleaning and Conditioning, Sampling, Data File Formats, TheCare and Feeding of Your Data Zoo.

Text Books:

1. Philipp K. Janert, Data Analysis with Open Source Tools, O'Reilly Media, Inc, November2010: First Edition.

Reference Books:

1. G James, D. Witten, T Hastie, and R. Tibshirani, An Introduction to Statistical Learning: with Applications in R, Springer, 2013
2. Chambers, John, Software for Data Analysis Programming with R, Springer, 2008
3. Trevor Hastie Robert Tibshirani Jerome Friedman, The Elements of Statistical Learning, Data Mining, Inference, and Prediction (2nd Edn.), Springer, 2014
4. Mark Gardener, Beginning R: The Statistical Programming Language, Wiley, 2013
5. Upadhyaya and A. Upadhyaya, Material Science and Engineering, Anshan Publications, 2007

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
AUGMENTED REALITY AND VIRTUAL REALITY
OPEN ELECTIVE

Course Code: GR22A4054   **L/T/P/C:3/0/0/3**

Course Outcomes:
1. Analyze about augmented reality.
2. Identify AR devices for various applications.
3. Analyze about virtual reality.
4. Interpret about usage of VR devices and human factors involved.
5. Apply AR & VR technology in various domains.

UNIT I
Introduction to Augmented Reality, The Relationship Between Augmented Reality and Other Technologies, Augmented Reality Concepts, How Does Augmented Reality Work?, Ingredients of an Augmented Reality Experience.

UNIT II
Augmented Reality Hardware, Major Hardware Components for Augmented Reality Systems, Augmented Reality Software, Major Software Components for Augmented Reality Systems, Software used to Create Content for the Augmented Reality Application.

UNIT III
Virtual Reality: The Three I's of Virtual Reality, A Short History of Early Virtual Reality, Early Commercial VR Technology , VR Becomes an Industry, The Five Classic Components of a VRSystem.
Input Devices: Trackers, Navigation, and Gesture Interfaces: Three-Dimensional Position Trackers, Navigation and Manipulation Interfaces

UNIT IV
Output Devices: Graphics, Three-Dimensional Sound, and Haptic Displays : Graphics Displays,Sound Displays, Haptic Feedback.
Human Factors in VR: Methodology and Terminology, User Performance Studies, VR Healthand Safety Issues, VR and Society

UNIT V:
Augmented Reality Applications, What Makes a Good Augmented Reality Application? Application Areas: Education, Gaming, Robotics, Health care, Manufacturing, Evaluating Augmented Reality Applications.

Text Books:
1. Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann, 2013.
2. Burdea, G. C. and P. Coffet. Virtual Reality Technology, Second Edition. Wiley IEEE Press, 2003/2006.

Reference Books:
1. LaValle, "Virtual Reality", Cambridge University Press, 2016.
2. Alan B Craig, William R Sherman and Jeffrey D Will, "Developing Virtual Reality Applications: Foundations of Effective Design", Morgan Kaufmann, 2009.
3. John Vince, "Virtual Reality Systems ", Pearson Education Asia, 2007.
4. Anand R., "Augmented and Virtual Reality", Khanna Publishing House, Delhi.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
BASICS OF JAVA PROGRAMMING
OPEN ELECTIVE

Course Code: GR22A3072   **L/T/P/C: 3/0/0/3**

Course Outcomes:

1. Apply knowledge on key attributes of Object-Oriented Programming (OOP) and control structures
2. create and manipulate classes and objects, employ various methods and method utilization.
3. Demonstrate expertise in both array-based and string-based structures.
4. understanding of Java's inheritance and interface concepts
5. proficient at organizing Java code using packages and exception handling

UNIT I:
Java Programming Fundamentals: Java Language, Key Attributes of Object-Oriented Programming, Java Development Kit, Simple Program, Create Blocks of Code, Keywords, Identifiers, The Java Class Libraries.
Data Types and Operators: Java's Primitive Types, Literals, Variables, Scope and Lifetime of Variables, Operators- Arithmetic, Relational, Logical, Bitwise, Assignment. Type conversion in Assignments, Using a Cast, Operator Precedence.
Program Control Structures: if, switch, for, enhanced for, while, do-while, break, continue.

UNIT II:
Introduction to Classes, Objects and Methods: Class Fundamentals, Objects creation, Reference Variables and Assignment, Methods, returning a Value, Using Parameters, passing objects to methods, passing arguments, Method Overloading, Constructors, Parameterized Constructors, Overloading Constructors. new Operator, this Keyword, Command-Line Arguments.

UNIT III:
Arrays: Introduction to Arrays, 1D Arrays, Multidimensional Arrays, Irregular Arrays, Using the Length Member. Arrays class of util package.
Strings: String class, constructors, length(), string literals, concatenation, Character extraction, string comparison, searching strings, modifying, data conversion, changing the case, joining, split(). String Buffer class: constructors, length(), capacity(), ensure Capacity(), set Length(), charAt(), setCharAt(), getChars(), append(), insert(), reverse(), delete(), deleteCharAt(), replace().

UNIT IV:
Inheritance: Basics, Inheritance Types, Using Super, Multilevel Hierarchy, Super class References and Subclass Objects, Method Overriding, Abstract Classes, Using final. **Interfaces:** Fundamentals, Creating and Implementing an Interface, Using Interface References, Implementing Multiple Interfaces, Extending Interfaces, Nested Interface.

UNIT V:
Packages: Package Fundamentals, Member Access, Importing Packages, Static import. **Exception Handling:** Exception Hierarchy, Fundamentals, Handling errors, Multiple Catch, Throwing and Rethrowing an Exception, Throwable, using finally, using throws, Creating Exception Subclasses.

Text Books:

1. Herbert Schildt, Dale Skrien, Java Fundamentals A Comprehensive Introduction, 1/e, Tata McGraw Hill, 2017.

2. Herbert Schildt, The Java complete References, 9/e, Tata McGraw Hill,2014.

Reference Books:

1. Y. Daniel Liang , An Introduction to JAVA Programming, 10/e, Tata McGraw Hill.

2. Kathy Sierra, Head First Java, 2/e, Shroff Publishers, 2012.

3. Balagurusamy, Programming with JAVA, 2/e, Tata McGraw Hill, 2014.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
INTRODUCTION TO DBMS
OPEN ELECTIVE

Course Code: GR22A3141   **L/T/P/C: 3/0/0/3**

Course Outcomes:
1. Identify the role of Database System Applications and the design issues related.
2. Design the logical model for the applications.
3. Construct a Database Schema, manipulate data using a SQL.
4. Apply the Schema Refinement techniques for a database design for optimized access.
5. For a given transaction-processing system, determine the transaction atomicity, consistency, isolation, and durability.

UNIT I
Introduction to Database And System Architecture: Database Systems and their Applications, Database Vs File System, View of Data, Data Models, Database Languages- DDL and DML, Transaction Management, Database users and Administrators, Database System Structure.

UNIT II
Introduction to Database Design: ER Diagrams, Entities, Attributes and Entity sets, Relationships and Relationship set, Extended ER Features, Conceptual Design with the ER Model, Logical database Design.
 Relational Model: Introduction to Relational Model, Basic Structure, Database Schema, Keys, Relational Algebra

UNIT III
SQL Queries and Constraints: SQL Data Definition, Types of SQL Commands, Form of Basic SQL Query, SQL Operators, Set Operators, Nested Queries, Aggregate Operators, NULL values, Integrity Constraints Over Relations, Joins, Introduction to Views, Destroying
/ Altering Tables and Views, Cursors, Triggers.

UNIT IV
Schema Refinement and Normal Forms: Introduction to Schema Refinement, Functional Dependencies, Properties of Decomposition, Reasoning about FD, Normal Forms.

UNIT V
Transaction Management: Transaction Concept, Transaction State, Concurrent Executions, Serializability, Testing for Serializability.
Concurrency Control: Lock based Protocols, Timestamp based protocols,
Recovery System: Recovery and Atomicity, Log based recovery, Shadow Paging, Recovery with concurrent Transactions.

Text Books:
1. "Data base Management Systems", Raghurama Krishnan, Johannes Gehrke,TATA McGraw Hill 3rdEdition
2. "Data base System Concepts", Silberschatz, Korth, McGraw hill, V Edition.
3. "Introduction to Database Systems", C.J.Date Pearson Education.

Reference Books:
1. "Database Systems design, Implementation, and Management", Rob & Coronel 5th Edition.
2. "Database Management Systems", P. Radha Krishna HI-TECH Publications 2005.
3. "Database Management System", Elmasri Navate, Pearson Education.
4. "Database Management System", Mathew Leon, Leo

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
INTRODUCTION TO DATA MINING
OPEN ELECTIVE

Course Code: GR22A4080   **L/T/P/C:3/0/0/3**

Course Outcomes:

1. Learn the concepts of database technology evolutionary path which has led to the need for data mining and its applications.

2. Apply pre-processing statistical methods for any given raw data.
3. Apply Apriori and FP growth algorithms for forming strong association rules.
4. Extract knowledge and implementation of data mining techniques
5. Apply the data mining algorithm for solving practical problems.

UNIT I
Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or a Data Warehouse System, Major issues in Data Mining.

UNIT II
Data Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction.
Introduction to Data Warehouse: Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Marts.

UNIT III
Mining Frequent Patterns, Associations: Basic Concepts, Market Basket Analysis, Efficient and Scalable Frequent Item set Mining Methods, Mining various kinds of Association Rules.

UNIT IV
Classification: Issues Regarding Classification, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification.
Prediction: Issues Regarding Prediction, Regression techniques.
Accuracy and Error measures: Evaluating the accuracy of a Classifier or a Predictor.

UNIT V
Cluster Analysis Introduction: Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods - k-Means and k-Medoids, Hierarchical Methods – Agglomerative, BIRCH.

Textbooks:

1. Data Mining– Concepts and Techniques - Jiawei Han & Micheline Kamber, Morgan Kaufmann Publishers, Elsevier, Second Edition,2006.

2. Introduction to Data Mining – Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Pearson education.

Reference Books:

1. Data Mining Techniques – Arun K. Pujari, Second Edition, Universities Press.
2. Data Warehousing in the Real World, Sam Aanhory and Dennis Murray, PearsonEdn Asia.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
PROGRAMMING IN PYTHON
OPEN ELECTIVE

Course Code: GR22A3077   **L/T/P/C: 3/0/0/3**

Course Outcomes:
1. Demonstrate the concepts of control flow, data structures and Functions in Python
2. Design python programs using functional programming
3. Implement the file handling operations , exception handling mechanism
4. Design python programs using object oriented programming and multithreadedprogramming concepts
5. Develop GUI based applications using Tkinter

UNIT I
Basic features of Python-Interactive execution, comments, types, variables, operators, expressions, Statements-assignment, input, print, Control flow-Conditionals, Loops, break statement, continue statement, pass statement, Functions, definition, call, scope and lifetimeof variables, keyword arguments, default parameter values, variable length arguments, recursive functions.

UNIT II
Sequences-Strings ,Lists and Tuples-basic operations and functions, iterating over sequences, Sets and Dictionaries- operations and functions, Functional programming-mapping, filtering and reduction, Lambda functions, List comprehensions. Scope, namespaces and modules, import statement, creating own modules, avoiding namespace collisions when importing modules.

UNIT III
Files-operations-opening, reading, writing, closing, file positions. Exceptions – raising and handling exceptions, try/except statements, finally clause, standard exceptions, custom exceptions. , iterators and generators, Python program examples.

UNIT IV
Object oriented programming- classes, constructors, objects, class variables, class methods, static methods, operator overloading. Inheritance-is-a relationship, composition, polymorphism, overriding, multiple inheritance, abstract classes, multithreaded programming, Python program examples.

UNIT V
GUI Programming with Tkinter, Widgets (Buttons, Canvas, Frame, Label, Menu, Entry, Text, Scrollbar, Combobox, Listbox, Scale), event driven programming-events, callbacks, binding, layout management-geometry managers: pack and grid, creating GUI based applications in Python.

Text Books:
1. Exploring Python, Timothy A. Budd, McGraw Hill Publications.
2. Introduction to Programming using Python, Ys.Daniel Liang, Pearson.
3. Python Programming, Sheetal Taneja and Naveen Kumar, Pearson.

Reference Books:

1. Introduction to Computer Science using Python, Charles Dierbach, Wiley India Edition.
2. Fundamentals of Python, K. A. Lambert, B.L. Juneja, Cengage Learning.
3. Think Python, how to think like a computer scientist, Allen B. Downey, SPD, O'Reilly.
4. Core Python Programming, Wesley J. Chun, second edition, pearson.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
INTERNET OF THINGS
OPEN ELECTIVE

Course Code: GR22A3147   **L/T/P/C: 3/0/0/3**

Prerequisites
Students are expected to have knowledge on Operating systems, Virtualization and Networking

Course Outcomes:
1. Learn characteristics, applications, components and challenges of Internet of Things (IOT)
2. Create understanding of IOT networking concepts – terminologies, stack components , infrastructure and data protocols
3. Create understanding of the concept of Cloud based IOT technologies, cloud service providers and security aspects
4. Develop skills in understanding and programming the Arduino and Raspberry Pi hardware platforms
5. Make the student understand the requirements, components ,challenges and develop various application areas - smart homes, smart grids, smart health care, smart cities and industrial IOT

UNIT I
Introduction to IOT: Characteristics of IOT, Applications of IOT, IOT Categories, IOT Enablers and Connectivity Layers, Sensors, Actuators, IOT Components & Implementation, Challenges for IOT

UNIT II
IOT Networking & Connectivity Technologies: Connectivity terminologies-IOT Node, LAN,WAN, Gateway, IOT protocol Stack vs. Web Stack, IOT Identification and Data Protocols-IPV4,IPV6,HTTP,MQTT,COAP,AMQP,DDS Connectivity Technologies – Zigbee, Bluetooth, LoRa

UNIT III
Cloud for IOT: IOT with Cloud-Challenges, Cloud service providers for IOT-Overview, Cloud service model, Cloud Computing – Security aspects, Case Study, Fog computing, Edge computing

UNIT IV
Hardware Platforms: Programming with Arduino-Features of Arduino, Components of Arduino Board, Arduino IDE, Program Elements, Raspberry Pi – Introduction, Architecture, PIN Configuration, Implementation of IOT with Raspberry Pi

UNIT V
IOT Applications : Smart Homes-Smart Home Origin, Technologies, Implementation, Smart Grids-Characteristics, Benefits, Architecture, Components, Smart Cities-Characteristics, Frameworks, Challenges, Industrial IOT-Requirements, Design Considerations, Applications

Text Books:
1. Internet of Things, Jeeva Jose, Khanna Publishing, 2018
2. Internet of Things, Abhishek S Nagarajan, RMD Sundaram, Shriram K Vasudevan, Wiley, 2019
3. IOT Fundamentals: Networking Technologies, Protocols and Use Cases for IOT, Rowan Trollope, David Hanes, Patrick Gassetete, Jerome Henry,Pearson Education Limted, 2017

Reference Books:

1. The Internet of Things, Michael Miller, Pearson Education Limited, 2015
   IoT Applications, Security Threats, and Countermeasures, Padmalaya Nayak, Niranjan Ray, P. Ravichandran, Taylor &Francis,2021
2. Internet of Things: Architecture, Implementation and Security, MayurRamgir, Pearson Education Limited, 2019
3. IOT Fundamentals: Networking Technologies, Protocols and Use Cases for IOT, Rowan Trollope, David Hanes, Patrick Gassetete, Jerome Henry, Pearson Education Limited, 2017

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
SCRIPTING LANGUAGES
OPEN ELECTIVE

Course code: GR22A4085   **L/T/P/C: 3/0/0/3**

Course Outcomes:
1. Analyze a problem, identify and define the computing requirements appropriate to itssolution.
2. Design Web pages with DB.
3. Implement the PHP Authentication Methodologies.
4. Implement PHP Encryption functions and Mcrypt Package
5. Understand the syntax and functions in Perl and Python.

UNIT- I
PHP Basics
PHP Basics- Features, Embedding PHP Code in your Web pages, outputting the data to the browser, Data types, Variables, Constants, expressions, string interpolation, control structures. Function, Creating a Function, Function Libraries, Arrays, strings and Regular Expressions.

UNIT -II
MySQL Basics
Introduction to MYSQL: Database Concepts, General Overview of MySQL database, Installation. Connecting and disconnecting from MySQl Server, Querying the database, Data Definition Language, Functions and Logical operators, Access privilege system.

UNIT -III
Advanced PHP Programming
Advanced PHP Programming: PHP and Web Forms, Files, PHP Authentication and Methodologies -Hard Coded, File Based, Database Based, IP Based, and Uploading Files with PHP, Sending Email using PHP, PHP Encryption Functions, the Mcrypt package.

UNIT- IV
PERL: Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.
Advanced PERL: Finer points of looping, pack and unpack, file system, data structures, packages, modules, objects, interfacing to the operating system.

UNIT -V
Python: Introduction to Python language, Python-syntax, statements, functions, Built-in-functions and Methods, Modules in Python, Exception Handling.

Text Books:
1. The World of Scripting Languages, David Barron,Wiley India. Beginning PHP and MySQL, 3rd Edition, Jason Gilmore,Apress Publications (Dream tech.).
2. Python Web Programming, Steve Holden and David Beazley ,New Riders Publications.

Reference Books:

1. Open Source Web Development with LAMP using Linux ,Apache,MySQL,Perl and PHP, Lee and B.Ware(Addison Wesley) Pearson Education.
2. Programming Python,M.Lutz,SPD.
3. PHP 6 Fast and Easy Web Development ,Julie Meloni and Matt Telles, Cengage
4. Learning Publications.
5. PHP 5.1,I.Bayross and S.Shah,The X Team,SPD.
6. Core Python Programming,Chun,Pearson Education.
7. Guide to Programming with Python,M.Dawson,Cengage Learning.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
SERVICES SCIENCE AND SERVICE OPERATIONAL MANAGEMENT
OPEN ELECTIVE

Course Code: GR22A4134   **L/T/P/C: 3/0/0/3**

Pre-Requisite(s): Fundamentals of Management, Operations Research

Course Outcomes:
1. Understand concepts of services and their significance in the economy and society and distinguish it from goods.
2. Understand the service strategy, design, and development.
3. Comprehend ways to design services and able to understand service guarantee, recovery, and failures.
4. Forecast the service demand, supply and facilitate various methods to operate and manage services.
5. Understand the service productivity and how innovation can be approached from services point of view

UNIT I
Introduction: Service operations, Role of service in economy and society, Indian service sector
Nature of Services and Service Encounters: Differences between services and operations, Service package, characteristics, various frameworks to design service operation system, Kind of service encounter, importance of encounters
Service-Dominant Logic: From Goods-Dominant logic to Service-Dominant logic,   Value Co- creation

UNIT II
Service Strategy and Competitiveness: Development of Strategic Service Vision (SSV), Data Envelopment Analysis
New Service Development: NSD cycle, Service Blueprinting, Elements of service delivery system
Service Design: Customer Journey and Service Design, Design Thinking methods to aid Service Design
Locating facilities and designing their layout: models of facility locations (Huff's retail model), Role of service-scape in layout design
Service Quality: SERVQUAL, Walk through Audit, Dimensions of Service quality & other quality tools

UNIT III
Service Guarantee & Service Recovery: Service guarantee and its types; Service failure – reasons for failure and service recovery strategies

UNIT IV
Forecasting Demand for Services: A review of different types of forecasting methods for demand forecasting.
Managing Capacity and Demand: Strategies for matching capacity and demand, Psychology of waiting, Application of various tools used in managing waiting line in services.
Managing Facilitating Goods: Review of inventory models, Role of inventory in services **Managing service supply relationship:** Understanding the supply chain/hub of service, Strategies for managing suppliers of service
Vehicle Routing Problem: Managing after sales service, understanding services that involve transportation of people and vehicle, Techniques for optimizing vehicle routes

UNIT V

Service Innovation: Services Productivity, Need for Services Innovation

Student Project:

Option 1: Choose any service organization around and present it from the perspective of: nature of service, classification of service, blueprint or service design analysis, service quality, and any additional perspective you would like to add.

Option 2: Choose any latest research paper in services and explain your understanding and feedback on the same.

Text Books:

1. Fitzsimmons & Fitzsimmons, Service Management: Operations, Strategy, Information Technology, McGraw Hill publications (7th edition)

Reference Books:

1. Wilson, A., Zeithaml, V. A., Bitner, M. J., & Gremler, D. D. (2012). Services marketing:Integrating customer focus across the firm. McGraw Hill.
2. Lovelock, C. (2011). Services Marketing, 7/e. Pearson Education India
3. Reason, Ben, and Lovlie, Lavrans, (2016) Service Design for Business: A Practical Guide to Optimizing the Customer Experience, Pan Macmillan India,
4. Chesbrough, H. (2010). Open services innovation: Rethinking your business to grow andcompete in a new era. John Wiley & Sons.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
IT PROJECT MANAGEMENT
OPEN ELECTIVE

Course Code: GR22A4135   **L/T/P/C: 3/0/0/3**

Course Outcomes:
1. Learn the techniques to effectively plan manage, execute the projects.
2. Learn the techniques to control projects within time and cost targets with a focus on Information Technology and Service Sector.
3. Learn various agile methodologies.
4. Apply agile project management techniques such as Scrum on real time applications.
5. Develop real time applications using agile project management techniques such asDevOps.

UNIT I
Project Overview and Feasibility Studies- Identification, Market and Demand Analysis, Project Cost Estimate, Financial Appraisal
Project Scheduling: Project Scheduling, Introduction to PERT and CPM, Critical Path Calculation, Precedence Relationship, Difference between PERT and CPM, Float Calculation and its importance, Cost reduction by Crashing of activity.

UNIT II
Cost Control and Scheduling: Project Cost Control (PERT/Cost), Resource Scheduling & Resource Leveling
Project Management Features: Risk Analysis, Project Control, Project Audit and Project Termination.

UNIT III
Agile Project Management: Introduction, Agile Principles, Agile methodologies, Relationship between Agile Scrum, Lean, DevOps and IT Service Management (ITIL).
Other Agile Methodologies: Introduction to XP, FDD, DSDM, Crystal

UNIT IV
Scrum: Various terminologies used in Scrum (Sprint, product backlog, sprint backlog, sprint review, retro perspective), various roles (Roles in Scrum), Best practices of Scrum.

UNIT V
DevOps: Overview and its Components, Containerization Using Docker, Managing Source Code and Automating Builds, Automated Testing and Test-Driven Development, Continuous Integration, Configuration Management, Continuous Deployment, Automated Monitoring.

Text Books:
1. Mike Cohn, Succeeding with Agile: Software Development Using Scrum
2. Notes to be distributed by the course instructor on various topics

Reference Books:
1. Roman Pichler, Agile Product Management with Scrum
2. Ken Schwaber, Agile Project Management with Scrum (Microsoft Professional)

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
MARKETING RESEARCH AND MARKETING MANAGEMENT
OPEN ELECTIVE

Course Code: GR22A4136   **L/T/P/C: 3/0/0/3**

Course Outcomes:
1. The students understand the significance of marketing management concepts, marketingenvironment, consumer behavior elements and strategies related to STP.
2. The student will be able to understand various product management strategies and the importance of branding and packing.
3. Comprehend the dynamics of marketing mix elements such as pricing, distribution, and promotion mix elements to leverage marketing concepts for effective decision making.
4. Students will demonstrate analytical skills in identification and resolution of problems pertaining to marketing management and marketing research and uses of various statistical tools in marketing research.
5. Understanding the concepts of internet marketing and the fundamentals of business-to- business marketing strategy, CRM strategies.

UNIT I
Marketing Concepts and Applications: Introduction to Marketing & Core Concepts, Marketing of Services, Importance of marketing in service sector.
Marketing Planning & Environment: Elements of Marketing Mix, Analyzing needs & trends in Environment - Macro, Economic, Political, Technical & Social
Understanding the consumer: Determinants of consumer behavior, Factors influencing consumer behavior
Market Segmentation: Meaning & Concept, Basis of segmentation, selection of segments, Market Segmentation strategies, Target Marketing, Product Positioning

UNIT II
Product Management: Product Life cycle concept, New Product development & strategy, Stages inNew Product development, Product decision and strategies, Branding & packaging

UNIT III
Pricing, Promotion and Distribution Strategy: Policies & Practices – Pricing Methods & Price determination Policies. Marketing Communication – The promotion mix, Advertising & Publicity, 5M's of Advertising Management. Marketing Channels, Retailing, Marketing Communication, Advertising

UNIT IV
Marketing Research: Introduction, Type of Market Research, Scope, Objectives & Limitations Marketing Research Techniques, Survey Questionnaire design & drafting, Pricing Research, Media Research, Qualitative Research
Data Analysis: Use of various statistical tools – Descriptive & Inference Statistics, Statistical Hypothesis Testing, Multivariate Analysis - Discriminant Analysis, Cluster Analysis, Segmenting and Positioning, Factor Analysis

UNIT V
Internet Marketing: Introduction to Internet Marketing. Mapping fundamental concepts ofMarketing (7Ps, STP); Strategy and Planning for Internet Marketing

Business to Business Marketing: Fundamental of business markets. Organizational buying process. Business buyer needs. Market and sales potential. Product in business markets. Price in business markets. Place in business markets. Promotion in business markets. Relationships, networks, and customer relationship management. Business to Business marketing strategy

Home Assignments:

Written Analyses of Cases – Students are expected to report on their analysis and recommendationsof what to do in specific business situations by applying concepts and principles learned in class (Case Studies to be shared by Faculty) e.g., "Marketing Myopia"

1. Field visit & live project covering steps involved in formulating Market Research Project

2. Measuring Internet Marketing Effectiveness: Metrics and Website Analytics

Text Books:

1. Marketing Management (Analysis, Planning, Implementation & Control) – Philip Kotler

2. Fundamentals of Marketing – William J. Stanton & Others

3. Marketing Management – V.S. Ramaswamy and S. Namakumari

4. Marketing Research – Rajendra Nargundkar

5. Market Research – G.C. Beri

6. Market Research, Concepts, & Cases – Cooper Schindl

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
INTRODUCTION TO DATA SCIENCE
OPEN ELECTIVE

Course Code: GR22A3056   **L/T/P/C: 3/0/0/3**
Prerequisites:
Knowledge of Python programming, Linear algebra, Statistics, Probability and Calculus

Course Outcomes:
1. Learn Numpy, Pandas for mathematical computation and Data Analysis
2. Analyze the importance of pre-processing techniques for Data Science
3. Learn and analyze various prediction and classification techniques on various datasets
4. Learn and analyze the applications of clustering techniques
5. Analyze Text data and Web scrapping data at morphological and syntactic and semantic levels using NLP techniques

UNIT I
Introduction to Data Science, Components of Data Science, Application of Data Science
NumPy: Array, Matrix and associated operations, Linear algebra and related operations
Pandas: Series, Data Frames, Panels, Reading files, Exploratory data analysis, Data preparation, Indexing, Slicing, Merging and Joining data. Working with MySQL databases
Data Pre-processing Techniques: Data Imputation, Data Encoding, Standardization and Normalization, Dimensionality reduction, Feature Selection methods

UNIT II
Regression Analysis: Introduction to Regression, Simple linear regression, Multi-linear regression, Evaluation metrics for regression
Classification Methods: Introduction to Classification, Naïve Bayes classifier, Decision Tree classifier, Support Vector Machines, Logistic Regression, Ensemble methods, Random Forest, Bagging, Boosting, Evaluation metrics for classification

UNIT III
Clustering Methods: Introduction to Clustering, Similarity distance measures, K-means algorithm, Hierarchical clustering algorithm, DB Scan algorithm, Evaluation metrics for clustering.

UNIT IV
NLP Overview, Tokenization, Stemming, stop words removal, POS tagging, Lemmatization, Feature extraction using SKlearn, Text Classification, Text Clustering.

UNIT V
Learning Best Practices for Model Evaluation:
Pipelining, Hyperparameter Tuning, Debugging algorithms with learning and validation curves

Text Books:
1. Python Machine Learning, Second Edition by Sebastian Raschka Vahid Mirjalili
   Statistics and Machine Learning in Python Edouard Duchesnay,

Reference Books:

1. Data Science From Scratch: First Principles with Python, Second Edition (Greyscale Indian Edition) Paperback – 5 May 2019 by Joel Grus (Author)

2. Practical Data Science with Python: Learn tools and techniques from hands-on examples to extract insights from data by Nathan George (Author)

3. HANDS ON INTRODUCTION TO DATA SCIENCE Hardcover – 2 April 2020 by Chirag Shah (Author)

4. Essential Math for Data Science: Take Control of Your Data with Fundamental Linear Algebra, Probability, and Statistics by Thomas Nield (Author)

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
USER-CENTRIC HUMAN COMPUTER INTERACTION
OPEN ELECTIVE

Course Code: GR22A3127   **L/T/P/C: 3/0/0/3**

Course Outcomes:

1. Learn the concepts of interaction design and how it relates to human computer interaction and other fields.
2. Design how technologies can be to change people's attitudes and behavior.
3. Apply the difference between qualitative and quantitative data and analysis.
4. Extract the social Mechanisms that are used by people to communicate and collaborate.
5. Explore the user Experience design and analyze the factors involved in design

UNIT I
Introduction: Introduction to User Centric Computing(UCC) and history, Issues and challenges, Latest research trends, User-Centric Design and Software Engineering.

UNIT II
Engineering User-Centric Systems: Components of SDLC - Contextual Inquiry, - Design Guidelines, Prototyping.

UNIT III
User-Centric Computing: The UCC framework with illustrative case study, User-Centric models-descriptive, predictive models and taxonomy, Introduction to GOMS family of models
Computational user models (classical), Keystroke-Level Model(KLM), (CMN)GOMS Model, The Fitts' Law, The Hick-Hyman Law.

UNIT IV
Computational user models(contemperory): 2D and 3D pointing models, The steering Law and constrained navigation, Model for hierarchial menu selection, Mobile typing models(sibgle finger and two thumb typing), Model for touch performance(FFitts' law),
Formal system models: Introduction to formal models in UCD, Formal modelling of user-computer dialogue.

UNIT V
Empirical Research Methods: Introduction and research question formulation, Variables determination and experiment design, Data Analysis including model building
User-Centric Design Evaluation: Introduction to User-Centric design evaluation and expert evaluation technique, : User evaluation and model-based evaluation.

Text Books:

1. Samit Bhattacharya (July, 2019). Human-Computer Interaction: User-Centric Computing for Design, McGraw-Hill India, Print Edition: ISBN-13: 978-93-5316-804-9; ISBN-10: 93-5316-804-X, E-book Edition: ISBN-13: 978-93-5316-805-6; ISBN-10: 93-5316-805-8

2. Alan Dix, Janet E. Finlay, Gregory D. Abowd and Russel Beale. (2003). Human-Computer Interaction (3rd Edition), Pearson.

Reference Books:

1. Ben Shneiderman, Catherine Plaisant, Maxine Cohen and Steven Jacobs. (2009). Designing the User Interfaces: Strategies for Effective Human-Computer Interaction (5th Edison), Pearson

Website Links:

https://paragnachaliya.in/wp-content/uploads/2017/08/HCI_Alan_Dix.pdf

GOKARAJU RANGARAJUINSTITUTE OF ENGINEERING AND TECHNOLOGY
DESIGN PATTERNS
OPEN ELECTIVE

Course Code: GR22A4063   **L/T/P/C: 3/0/0/3**

Course Outcomes:

1. Ability to analyze and apply different design patterns for real life scenarios.
2. Ability to solve Object oriented design problems with a case study of designing a Document Editor.
3. Illustrates the skill apply creational design patterns.
4. Demonstrates the ability to apply different structural design patterns.
5. Analyze and Apply different behavioral design patterns.

UNIT I

Introduction: What Is a Design Pattern?, Design Patterns in Smalltalk MVC, Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns solve Design Problems, How to Select a Design Pattern, How to Use a Design Pattern.

UNIT II

A Case Study: Designing a Document Editor: Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation, Summary.

UNIT III

Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns.
Structural Pattern Part-I: Adapter, Bridge, Composite.

UNIT IV

Structural Pattern Part-II: Decorator, Façade, Flyweight, Proxy.
Behavioral Patterns Part-I: Chain of Responsibility, Command, Interpreter, Iterator.

UNIT V

Behavioral Patterns Part-II: Mediator, Memento, Observer, State, Strategy, Template Method Visitor, Discussion of Behavioral Patterns. What to Expect from Design Patterns, A Brief History, The Pattern Community An Invitation, A Parting Thought.

Text Books:

1.Design Patterns by Erich Gamma, Pearson Education.

Reference Books:

1. Pattern's in JAVA Vol-I by Mark Grand,Wiley DreamTech.
2. Pattern's in JAVA Vol-II by Mark Grand,Wiley DreamTech.
3. JAVA Enterprise Design Patterns Vol-III by Mark Grand,Wiley DreamTech.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
NON-CONVENTIONAL ENERGY SOURCES
OPEN ELECTIVE

Course Code:GR22A3019   **L/T/P/C: 3/0/0/3**

Course Outcomes

1. Illustrate the concepts of solar radiation at different instants.
2. Analyze the performance characteristics of PV modules.
3. Compare the performance of wind energy at various circumstances.
4. Make use of various sustainable energy resources for power generation.
5. Explain operation and performance of Wave energy, Fuel cells and Batteries.

UNIT I
Solar spectrum-Solar Radiation on Earth's surface- Solar radiation geometry-Solar radiation measurements-Solar radiation data-Solar radiation on horizontal and tilted surfaces. Solar Thermal Conversion-Flat plate collectors concentrated collectors- construction and thermal analysis- Solar Applications-Solar Ponds-Heliostat systems-water heater-air heater- solar still.

UNIT II
Photovoltaic Cells - Equivalent Circuit - V-I Characteristics- Photovoltaic Modules – Constructional details - Design considerations – Tracking - Maximum power point tracking – Algorithms - PV solar system design with energy backup - Solar Thermo electric conversion.

UNIT III
Fundamentals of wind energy-power available in wind-BetzLimit- Aerodynamics of wind turbine-Wind Turbines-Horizontal and vertical axis turbines – their configurations-Wind Energy conversion systems.

UNIT IV
Various fuels-Sources-Conversion Technologies-Wet Processes–Dry Processes-Biogas generation–Aerobic and an aerobic digestion- Factors affecting generation of bio gas – Classification of bio gas plants-Different Indian digesters-Digester design considerations- Gasification process-Gasifiers – Applications. Geo-thermal Energy-sources-Hydrothermal Convective-Geo-pressure resources-Petro-thermal systems (HDR)-Magma Resources-Prime Movers.

UNIT V
Principle of operation-Open and closed cycles, Energy from Tides-Principle of Tidal Power-Components of tidal Power Plants-Operation Methods-Estimation of Energy in Single and double basin systems-Energy and Power from Waves-Wave energy conversion devices-Fuel Cells-Design and Principle of operation-Types of Fuel Cells-Advantages and disadvantages- Types of Electrodes- Applications-Basics of Batteries –Constructional details of Lead acid batteries- Ni-Cd Batteries.

Text Books:
1. G.D. Rai, Non Conventional Energy Sources, Khanna publishers.
2. D.P.Kothari, Singal, Rakesh, Ranjan, Renewable Energy sources and Emerging Technologies, PHI, 2009.

Reference Books:
1. B.H.Khan, Non Conventional Energy Sources, PHI Publications.
2. John Twidell & Wier, Renewable Energy Resources, CRC Press, 2009.
3. T. Ackermann, "Wind Power in Power Systems", John Wiley and Sons Ltd., 2005.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
CONCEPTS OF CONTROL SYSTEMS
OPEN ELECTIVE

Course Code: GR22A3095   **L/T/P/C: 3/0/0/3**

Course Outcomes
1. Infer the basic concept control systems.
2. Develop the mathematical model of the systems.
3. Analyze the time domain specifications and steady state error.
4. Outline the concept of stability of the system.
5. Solve the frequency response analysis.

UNIT I
BASIC CONCEPTS OF CONTROL SYSTEM
Terminology - plant, process, system, disturbances, controlled variable, manipulated variable etc., Block diagram of basic control system, application areas with examples. Classifications of control systems

UNIT II
MATHEMATICAL MODELLING OF SYSTEMS
Translational and rotational mechanical systems, electrical systems, Force voltage and force current analogy, Block diagram and signal flow graph representation of physical systems along with rules, properties, comparison and limitation, Mason's gain formula.

UNIT III
TIME RESPONSE ANALYSIS
Standard test signals along with examples of their usage, steady state errors for step, ramp and parabolic inputs, analysis of first and second order systems, Transient response specifications with numerical examples, Basic control actions and two position, proportional, P, PI, PID controllers, Limitations of time domain analysis.

UNIT IV
STABILITY
Concept of stability, types of stability, Routh's stability criterion, special cases with numerical examples, stability of closed loop system, concept of root locus, open loop and closed loop transfer poles, step by step procedure for root loci, numerical examples.

UNIT V
FREQUENCY RESPONSE ANALYSIS
Need of frequency response analysis, Sinusoidal response of linear system, methods used in frequency response, Bode Plot, Frequency domain specifications.

Text Books:
1. I J Nagrath, M.Gopal, Control System Engineering, New Age International Publishers, Fifth edition.
2. Norman S Nise, Control system engineering, John Wiley & Sons, Inc., Sixth edition

Reference Books:
1. Richard C. Dorf, Robert H Bishop, Modern control systems, Pearson Education International, Twelfth edition.
2. A Nagoor Kani, Control Systems, CBS Publishers.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ARTIFICIAL NEURAL NETWORKS AND FUZZY LOGIC
OPEN ELECTIVE

Course Code: GR22A4022   **L/T/P/C: 3/0/0/3**

Course Outcomes
1. Outline importance of BNN, ANN and its learning techniques and architectures.
2. Summarize the algorithms for various applications using Back propagation networks.
3. Interpret the concept of Fuzzy and Crisp sets.
4. Model Fuzzy membership Function and rules for Applications.
5. Analyze the parameters of Genetic Algorithm.

UNIT I
NEURAL NETWORKS I (Introduction & Architecture)
Neuron, Nerve structure and synapse, Biological Neural network, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks. Various learning techniques.

UNIT II
NEURAL NETWORKS II (Back Propagation Networks)
Architecture: perceptron model, solution, single layer artificial neural network, multilayer perception model; back propagation learning methods, effect of learning rule co-efficient; back propagation algorithm, factors affecting back propagation training, application of Neural Networks in Load Forecasting.

UNIT III
FUZZY LOGIC I (Introduction)
Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.

UNIT IV
FUZZY LOGIC II (Fuzzy Membership, Rules)
Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and
Fuzzy algorithms, Fuzzifications & Defuzzification's, Fuzzy Controller, application of Fuzzy logic control in washing machines.

UNIT V
GENETIC ALGORITHMS (GA)
Basic concepts, working principle, procedures of GA, flow chart of GA, Genetic representations, (encoding) Initialization and selection, Genetic operators, Mutation, Generational Cycle, application of genetic algorithm in economic load dispatch.

Text Books
1. J M Zurada , "An Introduction to ANN",Jaico Publishing House.
2. Neural Networks, Fuzzy Logic, And Genetic Algorithms: Synthesis and Applications - by S. RAJASEKARAN, G. A. VIJAYALAKSHMI PAI, PHI publishers.

Reference Books:
1. Hung T. Nguyen, Nadipuram R. Prasad, Carol L. Walker and Elbert A. Walker, "A First Course in Fuzzy and Neural Control" Chapman & Hall, CRC.
2. Driankov, Dimitra, "An Introduction to Fuzzy Control", Narosa Publication.
3. Timothy J Ross, "Fuzzy Logic with Engg.Applications", McGraw. Hill.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
PRINCIPLES OF COMMUNICATIONS
OPEN ELECTIVE

Course Code: GR22A3040   **L/T/P/C: 3/0/0/3**

Course Outcomes:

1. Apply concepts of modulation, frequency translation, gain and attenuation in communication systems.
2. Analyse the power spectrum characteristics of different modulation techniques.
3. Understand the role of multiplexing techniques in optimizing bandwidth utilization of Communication Systems.
4. Evaluate the suitability of specific digital modulation techniques for different communication applications.
5. Critically perform error analysis of each modulation scheme.

UNIT - I: Basics of Communication Systems
Definition and scope of communication systems, Types of communication systems: Analog and Digital, Block diagram of a communication system, Need for Modulation, Frequency translation, Electromagnetic spectrum, Gain, Attenuation and decibels.

UNIT - II: Analog Modulation
Amplitude Modulation (AM), Frequency Modulation (FM), Phase Modulation (PM) and its variants, Power Spectrum of different modulations, Comparison of modulation techniques.

UNIT - III: Pulse Analog Modulation
Ideal sampling, Sampling theorem, aliasing, interpolation, natural and flat top sampling in time and frequency domains. Introduction to PAM, PWM, PPM modulation schemes. Frequency Division Multiplexing (FDM) and Time division multiplexing (TDM).

UNIT – IV: Digital Modulation
Basics of digital modulation, Advantages of digital modulation over analog modulation, Types of digital modulation: ASK, FSK, PSK, QAM, Comparison of digital modulation techniques

UNIT - V: Performance Analysis of Analog and Digital Modulation
Sources of Noise in Communication Systems, Super heterodyne Receiver, Figure of Merit, Noise Figure. Signal-to-Noise Ratio (SNR) and Eb/N0 ratio, Bit Error Rate (BER) and its significance, Error performance analysis for different modulation schemes, Channel capacity and bandwidth efficiency.

Text Books:

1. An Introduction to Analog and Digital Communications, 2nd Edition, Simon Haykin, Michael Moher, John Wiley, March 2006.
2. Communication Systems by Simon Haykin, Second Edition, Wiley Student Edition, 2007.
3. Digital Communications by John G. Proakis and Masoud Salehi, 5e, McGraw Hill Publications, 2014.

Reference Books

1. Introduction to Data Communications and Networking, Wayne Tomasi, Pearson Education, 2005.
2. Digital & Analog Communication Systems By K.S. Shanmugam, John Wiley

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
SENSOR TECHNOLOGY
OPEN ELECTIVE

Course Code: GR22A3113   **L/T/P/C: 3/0/0/3**

Course Outcomes:

1. Demonstrate the concept of resistive sensors which can be employed for real life applications
2. Realize the concept of reactive sensors and understand the implications while deploying them in practice.
3. Understand the working principle of special purpose sensors and the need for developing smart sensors.
4. Comprehend the design and development of various wearable sensors for use in healthcare applications.
5. Able to design and perform experiments on the sensors and develop the projects based on the customer needs.

UNIT-I
General concepts and terminology of Sensor systems, Transducers classification-sensors and actuators, General input-output configurations, Static and dynamic characteristics of measurement system.

UNIT-II
Resistive sensors- Potentiometers, strain gages (piezo-resistive effect), resistive temperature detectors (RTD), thermistors, light dependent resistor (LDR), resistive hygrometers, resistive gas sensors.

UNIT-III
Inductive sensors - variable reluctance sensors, Hall effect, Eddy current sensors, Linear variable differential transformers (LVDT), variable transformers, magneto-elastic, magneto-resistive, and magnetostrictive sensors. Capacitive sensors- variable capacitor, differential capacitor.

UNIT-IV
Accelerometers: Characteristics and working principle, Types- Capacitive, Piezoresistive, piezoelectric; Gyroscopes: Characteristics and working principle, Rotor Gyroscope; Diaphragm Pressure Sensor – resistive & capacitive type (micro press sensor).

UNIT-V
Overview of various smart sensors: Digital temperature sensor (DS1621, TMP36GZ), Humidity sensor (DHT11, DHT22), Gas sensor (MQ2,MQ8), Pressure sensors (BMP180), Accelerometers (ADXL335); Structural health monitoring sensors, Introduction to MEMS and Flexible sensors.

Text Books:
1. B. C. Nakra, K.K. Choudhury, "Instrumentation, Measurement and Analysis" -3rd Edition, Tata McGraw, 2009
2. Jacob Fraden, "HandBook of Modern Sensors: physics, Designs and Applications", 3rd ed., Springer, 2010.

Reference Books:

1. A.K. Sawhney, "Electrical and Electronic Measurements and Instrumentation", DhanpatRai.
2. Er. R.K. Rajput, "Electronic Measurements and Instrumentation", S. Chand & Company Ltd. 3rd Edition.
3. Bentley, John P., "Principles of Measurement Systems", 4th edition, Pearson/Prentice Hall, 2005
4. Jon. S. Wilson, "Sensor Technology HandBook", Elsevier Inc., 2005.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
COMMUNICATION TECHNOLOGIES
OPEN ELECTIVE

Course Code: GR22A4045   **L/T/P/C: 3/0/0/3**

Course Outcomes:
1. Analyze the properties of basic Modulation techniques and apply them to Digital Communication
2. Apply error probability concepts to evaluate the performance of spread spectrum systems.
3. Understand the principle concepts of telecommunication systems and networking
4. Analyze link budgets for satellite communication, considering factors such as path loss, atmospheric effects, and antenna gain.
5. Evaluate the suitability of various technologies in cellular, mobile and wireless communication scenarios.

UNIT- I: Review of Digital Communication System
Review of fundamental concepts and parameters in Digital Communication. Digital modulation schemes, Power spectra of digital modulation signals.

UNIT- II: Spread-Spectrum Modulation
Introduction, Pseudo-Noise sequences, direct- sequence spread spectrum (DSSS) with coherent BPSK, processing gain, probability of error, frequency-hop spread spectrum (FHSS). Application of spread spectrum: CDMA.

UNIT- III: Telecommunication Systems: Telephones Telephone system, Paging systems, Internet Telephony. **Networking and Local Area Networks:** Network fundamentals, LAN hardware, Ethernet LANs, Token Ring LAN.

UNIT- IV
Satellite Communication: Satellite Orbits, satellite communication systems, satellite subsystems, Ground Stations Satellite Applications, Global Positioning systems.
Optical Communication: Optical Principles, Optical Communication Systems, Fiber –Optic Cables, Optical Transmitters & Receivers, Wavelength Division Multiplexing.

UNIT-V:
Cellular and Mobile Communications: Cellular telephone systems, AMPS, GSM, CDMA, and WCDMA.
Wireless Technologies: Wireless LAN, PANs and Bluetooth, ZigBee and Mesh Wireless Networks, Wimax and MANs, Infrared wireless, RFID communication, UWB.

Text Books:

1. Introduction to Data Communications and Networking, Wayne Tomasi, Pearson Education, 2005.
2. Simon Haykin and Michael Moher, "Modern Wireless Communications," Pearson Education, 2005. 4. Marvin K. Simon, Sami M. Hinedi and W. C. Lindsay, "Digital Communication Techniques," Eastern Economy Edition, 2010.

Reference Books:

1.   Principles of communication systems By Taub Schilling, T.M.H
2.   Andrew J Viterbi, "CDMA principles spread spectrum communications," Adison Wesley, 1995.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
INDUSTRIAL AUTOMATION AND CONTROL
OPEN ELECTIVE

Course Code: GR22A3030   **L/T/P/C:3/0/0/3**

Prerequisites: Manufacturing Technology

Course Outcomes:
1. Explain the major automation theories, approaches and methodologies used in manufacturing.
2. Apply the knowledge for implementing the automated flow lines.
3. Employ the assembly systems and line balancing for automation
4. Implement the knowledge of material handling and storage systems in current industries.
5. Design adaptive control system for automated manufacturing.

UNIT I
Introduction: Introduction to automation, principles, reasons, types and strategies of automation, pneumatic and hydraulic components circuits, Automation in machine tools. Mechanical feeding, tool changing and machine tool control transfer the automaton.

UNIT II
Automated flow lines: Methods of work part transport transfer, Mechanical buffer storage control function, design and fabrication consideration. Analysis of Automated flow lines: General terminology and analysis of transfer lines without and with buffer storage, partial automation, implementation of automated flow lines**.**

UNIT III
Assembly system and line balancing: Assembly process and systems assembly line, line balancing methods, ways of improving line balance, flexible assembly lines.

UNIT IV
Automated material handling and storage systems: Types of equipment, functions, analysis and design of material handling systems, conveyor systems, automated guided vehicle systems. Automated storage and retrieval systems; work in process storage, interfacing handling and storage with manufacturing.

UNIT V
Adaptive control systems: Introduction, adaptive control with optimization, adaptive control with constraints, application of adaptive control in machining operations. Consideration of various parameters such as cutting force, temperatures, vibration and acoustic emission in the adaptive controls systems.

Text Books:
1. Mikell P.Groover, Automation, Production Systems, and Computer- integrated Manufacturing, prentice Hall, 2014
2. Serope Kalpakjian and Steven R. Schmid, Manufacturing – Engineering and Technology, 7th edition, Pearson, 2013

Reference Books:

1. Automation, Production Systems, and Computer-Integrated Manufacturing. (2016). India: Pearson India.
2. Bolz, R. W. (2012). Manufacturing Automation Management: A Productivity Handbook. United States: Springer US.
3. Boucher, T. O. (2012). Computer Automation in Manufacturing: An Introduction. Switzerland: Springer US.
4. Altintas, Y. (2012). Manufacturing Automation: Metal Cutting Mechanics, Machine Tool Vibrations, and CNC Design. United States: Cambridge University Press.
5. Morriss, S. B. (1995). Automated manufacturing systems. United Kingdom: Glencoe.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
COMPOSITE MATERIALS
OPEN ELECTIVE

Course Code: GR22A3105   **L/T/P/C: 3/0/0/3**
Prerequisites: Material Engineering

Course Outcomes:

1. Identify the types of composite materials and their characteristic features
2. Explain the methods employed in composite fabrication.
3. Differentiate the strengthening mechanisms of composite and its corresponding effect on performance
4. Analyze the various criterions for isotropic, anisotropic and composite materials, prediction of laminates failure.
5. Examine experimental techniques utilized for failure mode of composites.

UNIT I
Definition and applications of composite materials, Fibers- glass, carbon, ceramic and aramid fibers; Matrices- polymer, graphite, ceramic and metal matrices; characteristics of fibers and matrices. Lamina-assumptions, macroscopic viewpoint, generalized Hooke's law, reduction of homogeneous orthotropic lamina, isotropic limit case, orthotropic stiffness matrix, commercial material properties, rule of mixtures, transformation matrix, transformed stiffness.

UNIT II
Manufacturing of composite materials, bag moulding, compression moulding, pultrusion, filament welding, other manufacturing processes

UNIT III
Basic assumptions of laminated anisotropic plates, symmetric laminates, angle ply laminates, cross ply laminates, laminate structural moduli, evaluation of lamina properties, determination of lamina stresses, maximum stress and strain criteria.

UNIT IV
Von Mises Yield criterion for isotropic materials, generalized Hill's criterion for anisotropic materials, Tsai- Hill's criterion for composites, prediction of laminate failure, thermal analysis of composite laminates.

UNIT V
Analysis of laminated plates- equilibrium equations of motion, energy formulation, static bending analysis, buckling analysis, free vibrations, natural frequencies.

Text Books:

1. Gibson R.F. Principles of Composite Material Mechanics, second edition, McGraw Hill,1994.
2. Hyer M.W., Stress Analysis of Fiber- Reinforced Composite Materials, McGraw Hill,1998.

Reference Books:

1. Clyne, T. W. and Withers, P. J., "Introduction to Metal Matrix Composites", Cambridge University Press, 1993.
2. Strong, A.B., "Fundamentals of Composite Manufacturing", SME, 1989.
3. Sharma, S.C., "Composite materials", Narosa Publications, 2000.
4. Broutman, L.J. and Krock,R.M., " Modern Composite Materials", Addison-Wesley, 1967.
5. Introduction to Composite Materials Design by Ever J. Barbero 3rd Edition 2017

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
OPERATIONS RESEARCH
OPEN ELECTIVE

Course Code: GR22A3018   **L/T/P/C: 3/0/0/3**

Course Outcomes:

1. Apply the various linear programming techniques for optimal allocation of limited resources such as machine, material and money

2. Solve transportation problems to minimize cost and understand the principles of assignment of jobs and recruitment policies.

3. Solve sequencing problems and to distinguish various inventory models and develop proper inventory policies

4. Apply game theory to analyze various business competitions and analyze the various waiting line oriented situations.

5. Develop optimum replacement policy and Dynamic Programming Techniques.

UNIT I

Introduction: Development – Definition– Characteristics and Phases of operations Research– Types of models – operation Research models– applications.
Allocation: Linear Programming Problem Formulation – Graphical solution – Simplex method –Artificial variables techniques -Two–phase method, Big-M method – Duality Principle.

UNIT II

Transportation models: Formulation – Methods for finding feasible solutions; North west corner rule, Least cost entry method, Vogel's approximation method. Optimal solution; MODI method. Unbalanced transportation problem and Degeneracy.
Assignment models - Formulation – Optimal solution - Variants of Assignment Problem

UNIT III

Sequencing: Introduction – Flow –Shop sequencing – n jobs through two machines – n jobs through three machines – Job shop sequencing – two jobs through 'm' machines.
Inventory: Introduction – Single item – Deterministic models – Purchase inventory modelwith one price break and multiple price breaks – shortages are not allowed – Stochastic models – demand may be a discrete variable or continuous variable – Instantaneous production. Instantaneous demand and continuous demand and no set up cost.

UNIT IV

Theory of games: Introduction – Minimax (maximin) – Criterion and optimal strategy – Solution of games with saddle points – Rectangular games without saddle points – 2 X 2 games – dominance principle– m X 2 and 2 X n games -graphical method.
Waiting lines: Introduction – Single Channel – Poisson arrivals – exponential service times – with infinite population and finite population models– Multichannel – Poisson arrivals – exponential service times with infinite population single channel Poisson arrivals.

UNIT V

Replacement: Introduction – Replacement of items that deteriorate with time – when money value is not counted and counted – Replacement of items that fail completely, group replacement.

Dynamic programming: Introduction – Bellman's Principle of optimality – Applications of dynamic programming- capital budgeting problem – shortest path problem – linear programming problem.

Text Books:

1. Operations Research - Prem Kumar Gupta and D S Hira/ S Chand Publishing/ 2015
2. Operations Research / S. D.Sharma / KedarNath RamNath Publication/2020

Reference Books:

1. Operations Research / R.Panneerselvam, 3rd Edition/PHI Publications/ 2023
2. Operations Research An Introduction - Hamdy A Taha/8 th Edition/ Prentice Hall/2006
3. Principles of Operations Research: With Applications to Managerial Decisions - Harvey M. Wagner/Prentice-Hall Operations Research/2020
4. Operations Research - Kanthi Swarup, P.K. Gupta, Man Mohan Sultan Chand & Sons/ 2019
5. Operations   Research / A.M.Natarajan, P.Balasubramani,A. Tamilarasi / Pearson Education/2006

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ENGINEERING MATERIALS FOR SUSTAINABILITY
OPEN ELECTIVE

Course Code: GR22A3009   **L/T/P/C: 3/0/0/3**

Pre-requisites: Building materials and construction planning, Concrete Technology
Course Outcomes:
1. Describe the different types of environmental factors effecting materials
2. Report the work in sustainability for research and education
3. Illustrating the broad perspective in thinking for sustainable practices
4. Perform cost/benefit analysis and life-cycle analysis of green buildings.
5. Identify and compare cost and performance of building materials

UNIT I

Sustainability – Introduction, Need and concept of sustainability, Social- environmental and economic sustainability concepts. Sustainable development, Nexus between Technology and Sustainable development, Challenges for Sustainable Development. Multilateral environmental agreements and Protocols – Clean Development Mechanism (CDM), Environmental legislations in India – Water Act, Air Act

UNIT II

Air Pollution, effects of Air Pollution; Water pollution-sources, Sustainable wastewater treatment, Solid waste-sources, impacts of solid waste, zero waste concept, 3R concept, Global environmental issues-Resource degradation, climatic change, Global warming, Ozone layer depletion, Regional and Local Environmental issues. Carbon credits and carbon trading, carbon foot print.

UNIT III

Green Building Materials, Basic concepts of sustainable habitat, green buildings, green materials for building construction, material selection for sustainable design, green building certification, Methods for increasing energy efficiency of buildings. Sustainably managed Materials, Depleting natural resources of building materials; renewable and recyclable resources; energy efficient materials; non-renewable Energy of Materials

UNIT IV

Green cement, Biodegradable materials, Smart materials, Manufactured Materials, Volatile Organic Compounds like acetone, formaldehyde, BTEX substances, Natural Non-Petroleum Based Materials, Recycled materials, Renewable and Indigenous Building Materials, Engineering evaluation of these materials

UNIT V

Green Building Planning and Specifications, Environment friendly and cost effective Building Technologies, Integrated Life cycle design of Materials and Structures, Green Strategies for Building Systems, Alternative Construction Methods, Energy Conservation Measures in Buildings, Waste &Water

management and Recycling in Sustainable Facilities, Heating, Ventilation and Air Conditioning, Passive Solar & Daylight, Plumbing and its Effect on Energy Consumption

Text Books:
1. Alternative Building Materials and Technologies (2007) – K S Jagadeesh, B V Venkata RamaReddy & K S Nanjunda Rao – New Age International Publishers
2. Integrated Life Cycle Design of Structures (2002)– AskoSarja – SPON Press
3. Non-conventional Energy Resources (2012) – D S Chauhan and S K Srivastava – New Age International Publishers

Reference Books:
1. Green Buildings (2007) McGraw hill publication by Gevorkian
2. Emerald Architecture (2008) case studies in green buildings, The Magazine of Sustainable Design
3. Understanding Green Building Guideline (2010): For Students and Young Professionals, Traci Rose Rider, W. W. Norton & Company Publisher.
4. Understanding Green Building Materials (2011) Traci Rose Rider, W. W. Norton & Company Publisher.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
GEOGRAPHIC INFORMATION SYSTEMS AND SCIENCE
OPEN ELECTIVE

Course Code:GR22A3086   **L/T/P/C: 3/0/0/3**

Pre-Requisites: Surveying and Geomatics

Course Outcomes:
1. Interpret the fundamental concepts of Geographic Information Science and Technology along with different data structures.
2. Demonstrate Map creation and design principles, including thematic map display, employment of map projections and cartographic design.
3. Analyze the types of digital maps for different themes.
4. Apply the spatial analysis to remote sensing data to generate thematic maps.
5. Solve the real life problems associated with geospatial and remote sensing.

UNIT I
Fundamentals of GIS – Information Systems, Modelling Real World Features Data, Data Formats, Applications of GIS, – Spatial and Non-spatial, Components, Data Collection and Input, Data Conversion, Database Management – Database Structures, Files; Standard Data Formats, Compression Techniques, Hardware – Computing, printing and scanning systems; Software – Standard Packages like Arc view, ArcGIS (commercial) & Auto-CAD Map, Map Info etc. QGISopen software- Salient features.

UNIT II
Topology – Types of Errors, Editing and Error Rectification, Types of Topology, Modeling topological Relationships, Tolerances.

UNIT III
Map – mapping concepts, analysis with paper-based maps, limitations, Computer Automated Cartography– History and Developments, GIS- Definition, advantages of digital maps.

UNIT IV
Spatial Analysis and Modelling – Proximity Analysis, Overlay Analysis, Buffer Analysis, Network Analysis, Spatial Auto Correlation, Gravity Modelling, DTM/DEM, Integration with Remote Sensing data

UNIT V
GIS Project Planning and Implementation – Under Standing the Requirements, Phases of Planning, Specifications, Data Procurement, Tendering, Human Resources, Back Up, Monitoring Progress

Text Books:
1. Concepts & Techniques of GIS by C. P. Lo Albert, K. W. Yonng, Prentice Hall (India) Publications, 2nd edition, 2016.
2. Fundamental of GIS by Mechanical designs John Wiley &Sons, 4th edition, 2008.
3. Principals of Geographic Information Systems – Peter Beur and Rachael A.Mc Donnell, Oxford Publishers 2016.

Reference Books:

1. Remote Sensing and Geographical Information systems by M. Anji Reddy JNTU Hyderabad.4[th]edition, 2014, B. S. Publications.

2. Introduction to Geographic Information Systems by Kang-tsung Chang, Tata McGraw-Hill Publishing Company Limited- 2008.

3. Remote sensing of the environment –An earth resource perspective by John R Jensen, PrenticeHall 4. GIS by Kang – tsung chang, TMH Publications & Co., 2nd edition, 2013.

4. Basics of Remote sensing & GIS by S.Kumar, Laxmi Publications, 1st edition,2016.

5. Remote Sensing and its applications by LRA Narayana, University Press 1999.

6. Remote sensing and image interpretation by Thomas Lillesand, 7th Edition, John Wiley&sons,6th edition 2011.

7. Fundamentals of Geographic Information systems by Michael N. Demers, 4th Edition, Wiley Publishers, 2012.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ENVIRONMENTAL IMPACT ASSESSMENT
OPEN ELECTIVE

Course Code:GR22A4011   **L/T/P/C: 3/0/0/3**

Pre-Requisites: Environmental science
Course Outcomes:
1. Identify, predict and evaluate the environmental effects of proposed actions and projects.
2. Explain the appropriate methodologies for environmental impact prediction and assessment.
3. Analyze the importance of Public Participation, Fault Tree Analysis and Consequence analysis in EIA.
4. Understand the activities in environmental auditing.
5. Plan EIA for developmental projects.

UNIT I
Introduction: Concepts of EIA methodologies – Sustainable development- Need for Environmental Impact Assessment (EIA) - Environmental Impact Statement (EIS) – Evolution of EIA: Screening and scoping; Rapid EIA and Comprehensive EIA

UNIT II
Introduction to EIA, Criteria for the selection of EIA Methodology, General Framework for Environmental Impact Assessment, Characterization and site assessment. Environmental Risk Analysis, Definition of Risk, Matrix Method; Checklist method.

UNIT III
Prediction and Assessment: Public participation Fault tree analysis, Consequence Analysis; Socioeconomic aspects, measures of the effectiveness of pollution control activities;

UNIT IV
Environmental Legislation: Introduction to Environmental Management Systems; Environmental Statement - procedures; Environmental Audit: Cost-Benefit Analysis;

UNIT V
Life Cycle Assessment, Resource Balance, Energy Balance & Management Review - Operational Control - Case Studies on EIA with reference to Indian Scenario.

Text Books:
1. Y Anjaneyulu, and Valli Manikkam, Environmental Impact Assessment Methodologies, BSP Books PVT Ltd., 2nd edition, 2011.
2. R.R. Barthwal, Environmental Impact Assessment, New Age International Private Limited, 2nd edition, 2012.
3. Canter R.L., Environmental Impact Assessment, Mc Graw Hill International Edition, 2nd edition,1997.

Reference Books:

1. Kolluru Rao, Bartell Steven, Pitblado R and Stricoff "Risk Assessment and Management Handbook", McGraw Hill Inc., New York, 1996.
2. Judith Petts, Handbook of Environmental Impact Assessment Vol. I &II, Blackwell Science,1999.
3. Cutter, S.L., "Environmental Risk and Hazards", Prentice-Hall of India Pvt. Ltd., New Delhi, 1999.
4. Anji Reddy Mareddy, Environmental Impact Assessment: Theory and Practice, Butterworth-Heinemann publisher, 1st Edition, 2017.
5. MoEF & CC, Govt. of India: EIA notification and subsequent amendments

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